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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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A Majority of 62

THE attack on the Safeguarding of Industries Act and "other protective measures" in the House of Commons on Monday was defeated by a Government majority of 62. Roughly, it was a vote either for or against the Government, and the figures indicate how largely the debate and division proceeded on party lines. The mover of the Opposition amendment to the Address was Sir John Simon, who could argue for the complete repeal of all such legislation without inconsistency, since, unlike many of his old colleagues, he never recognised the duty of establishing key or any other industries by means of a tariff or otherwise. He stated his case very much as so accomplished a dialectician might present a petition for divorce or open a prosecution on the capital charge. It was just the kind of speech which Balfour must have had in mind when he spoke of him as "great on a small point and small on a great point." On the other side we had Sir Philip Lloyd-Greame defending the Act in all its aspects and operations as unreservedly as Sir John Simon had

condemned it. There were other speakers of the same type who approached the question simply from the particular party angle they favoured. From this class the ordinary person anxious to discover the real merits or demerits of the case under review derives little guidance, and these speeches may be dismissed as little more than artillery for the discharge of party ammunition.

The debate, however, was redeemed from sheer partisanship by the intervention of several members with practical business experience, who discussed the Act from the purely business side. For example, on the one side, Dr. Clayton (making a maiden speech) described the position of firms who had developed the manufacture of tungsten in this country, and who without the assistance of the Safeguarding Act would have to stop manufacture. Lieutenant-Commander Astbury, again, dispersed some popular misconceptions as to the price and quality of British dyestuffs, showed how German price policy—charging low figures for colours produced here and high figures for those of which they have a monopoly—is directed to breaking up the British industry, and surprised the House with the wide range of colours now being successfully produced in this country. On the other side there was Mr. H. Spencer, a new member, who put the particular grievances of the merchant class under the Act with skill and knowledge, and pleaded for a complete return to our pre-war policy of unrestricted free imports.

From various sectional points of view the case, sometimes for and sometimes against the Act, was put in a way that seemed for the moment to carry conviction. What one missed, however, was a frank recognition of the conditions in which the fundamental principle of the Act was deliberately adopted by this country and the pledges definitely held out to British firms to establish new industries on the assurance that for some time they would be protected against unrestricted foreign competition. There can be no doubt about such pledges. When the country wanted dyes, optical glass, magnetos, and the other commodities for which we had depended on Germany, British firms were encouraged hastily to embark on their manufacture in order both that urgent war-time requirements should be met and that never again should the country be left in an abject condition of dependence on foreign sources. We miss in the criticism of the Act any serious effort to face those pledges and keep them, whether in regard to national security for the future or in regard to our obligations to those who volunteered to meet the country's needs. Instead the position taken up is a purely opportunistic one—"When we promised to support British production we could not get any stuff from Germany; now

that German supplies are available again and cheap let them in free and let British production look after itself." That attitude, so far, has properly failed to command the support of the country or of the House.

But between the wholesale defence and the wholesale condemnation of the Dyestuffs and Safeguarding Acts as they stand is a middle line which deserves consideration. It was represented very fairly in the debate by Sir Alfred Mond, who by training and associations is much more predisposed to be friendly than unfriendly to any branch of British chemical industry. "The key industries provisions," he reminded the House, "were started with the specific and definite object of enabling new industries, embarked upon during the war, to get protection as against the Germans. It was a definite object of endeavouring to keep alive in this country industries started during the war in a very scientific manner—industries which were set up in this country at the most critical moment of the war." To that position, judging from his speech, Sir Alfred Mond remains entirely loyal. But he is obviously uncomfortable about the administration of the safeguarding measures, and asks for a thorough inquiry into it. Provided there is no surrender of the main purposes and principles, we see no objection to an impartial review of the present position in the light of our more recent experience. At the time the Acts were passed the Board of Trade could afford to do very much what it liked; it is much more exposed to-day to the pressure of public opinion. If the administrative machinery is really the best that can be devised an impartial inquiry would only strengthen the position; if it is capable of such amendment as would still secure the desired ends with diminished irritation and inconvenience to the classes adversely affected the advantage would be well worth the effort.

An Effort to Cheapen Nitrate

At the recent meeting of the British Sulphate of Ammonia Federation Mr. Milne Watson drew attention to the importance of reducing the cost of sulphate of ammonia to a minimum for the reason that competition has to be faced not only from the producers of synthetic nitrogen, but there were signs that the Chilean nitrate companies were making determined efforts to reduce their working expenses by getting higher yields from the raw material. For the last forty years Chilean nitrate has been elaborated by a system of lixiviation in which strong liquors, for the purpose of crystallization, are enriched by contact with the nitrate content of the raw material. In the course of the extraction of the raw material the strong liquors are succeeded by weaker liquors, and, finally, by water. This system has much to commend it when good-quality caliche is to be treated, but the exhaustion of the rich deposits has necessitated the utilisation of lower-grade material, so that improved methods of extraction are called for. So long as an abundance of high quality caliche was obtainable there was no particular incentive to adopt better technical methods, for profits were large and competition was by no means severe.

Within quite recent years, however, the producers have had to fall back on deposits containing only some

15 per cent. of nitrate as against the 30 to 50 per cent. contained in the old variety of caliche. An additional handicap is the large proportion of fines which is found on the nitrate grounds to-day, these fines making the process of lixiviation a far more difficult task to conduct with efficient extraction. Moreover, as time goes on the proportion of fines seems likely to increase. It is said, in fact, that at the present time the producers are only able to extract about 50 per cent. of the nitrate contained in the deposits, and for this reason considerable attention is being given to new methods of lixiviation and filtering. It has been estimated that a 40 per cent. reduction in cost should be capable of being effected with improved processes, and we notice that Sir Robert Harvey mentioned at the recent annual meeting of the Lagunas Syndicate that advantage had been taken of the temporary closing down of the oficinas to change the methods of handling and treatment. Sir Robert referred to the installation of a method which, "it was claimed would lead to an improved yield and consequent reduction in the cost of manufacture." The new method referred to is, we understand, the Butters process, which in the treatment of fines recovers 90 per cent. of the nitrate content, and which effects an economy in fuel amounting to some 50 per cent. There is no doubt that improved methods of mining, better extraction, and more efficient utilisation of fuel will do much in the near future to decrease the cost of producing nitrate, and developments of considerable technical interest are likely to take place.

Chemical Trade Wages Position

ALTHOUGH the position created in the heavy chemical trade by the employers' claim for a reduction in wages and the non-acceptance of the proposals by the employees is a sufficiently serious one, it is very gratifying to learn that both sides appear to be alive to the far-reaching effects which a stoppage would entail, and anxious to bring the negotiations to a mutually satisfactory conclusion. It will be remembered that a recent meeting of representatives of both sides of the Joint Industrial Council failed to come to any decision on the employers' proposal, which was for a reduction in wages from December 31 of 1d. per hour in the case of time-workers, 1½d. for shift-workers, with ½d. per hour reduction for those below 18 years of age, and a proportionate reduction for the piece-workers. Meanwhile another discussion has been arranged to take place at the Ministry of Labour on December 19, when it is hoped that some course of action satisfactory to all concerned will be decided on. We understand from Mr. W. T. Kelly, one of the employees' officials, that the men generally regard the proposals as unwarranted at this time. Taking the present position of the industry as a whole, together with what they know of its prospects, and bearing in mind the necessity of reducing costs of production, they feel the employers should stay their hand for the present and allow trade a chance of recovering before pressing the further reductions. The only deviation from this view was in one or two isolated cases, where it was held that the actual amount of the proposed reductions was unwarranted. They all appreciated the bad times

through which the chemical industry has been passing, and they were glad to find the various points raised by their representatives were being considered by the employers with due consideration.

It is unfortunate that, at the time of writing, there is no definite prospect of a settlement of the negotiations which have been proceeding in the drug and fine chemical industry as the result of the workers' refusal to accept a new wages scale involving reductions ranging, according to class and age, from 1s. to 13s. per week. A ballot of the workers has been concluded on the question of resisting the cuts by a strike and standing out for trade union recognition. A meeting of the unions was held in London on Thursday to consider what action should be taken.

The Hydrogenation of Coal

THE liquefaction of coal by hydrogenating a portion of its constituents and producing thereby a series of tars and oils has always proved an alluring proposition. The main worker in this field has, of course, been Dr. Friedrich Bergius, although Fischer and Schrader have been experimenting upon a somewhat different line. For some time one has heard a good deal about the claims which have been made for these processes, but exact scientific information has not been easy to obtain. For this reason the Mining Society of the University of Birmingham is to be congratulated on having persuaded Dr. Bergius to lecture before it at the end of last month, for the solution of the problem of the conversion of coal into liquid fuels is one that intimately affects the welfare of all those countries which, like our own, have no natural source of oil. Dr. Bergius referred in his lecture to the well-known experiments which he has conducted in connection with the formation of coal synthetically, and it was mainly as a result of these investigations that he was led to believe that it might be possible to introduce hydrogen into coal, thereby effecting both chemical and physical changes. After a long series of experiments success was achieved, the process first being carried through with synthetic coal, and afterwards with soft natural coal.

Dr. Bergius has admitted that there must necessarily be considerable technical and financial difficulties associated with the operation of the process on a large industrial scale, but these can be left for the future to solve. For the moment it is sufficient to know that coal can be transformed into a liquid fuel to about 90 per cent. of its weight, the coal being treated with hydrogen in steel vessels at a pressure of 100 atmospheres. Starting with heavy tar oils, it was found that about 80 per cent. of the weight of the original material could be obtained as light oils, leaving 20 per cent. of a good quality pitch. Dr. Bergius gave some interesting information in connection with the transformation of heavy oils and oil residues into light oils and motor spirit. The treatment is applicable not only to natural oils but to the tars from gas and coke-oven establishments. Such materials may be converted largely into motor spirit and Diesel oil, the residue being asphalt. Work on a commercial scale is now being carried on at Rheinau near Mannheim, where a plant with a capacity of 60 tons per day has been erected.

The "Therminological" Inquiry

THE decision of the Board of Trade to appoint a committee to inquire and report as to the method of charging for gas on a thermal basis is no doubt intended to meet the suspicions of consumers as to the bearing of this basis on their interests. In all cases where public services are carried out by private companies it is desirable that the public should feel they are being well served, and any steps which tend to make better known the scientific basis of the therm measurement, so little understood by the great mass of small consumers, is to be welcomed. The members of the committee are:—Sir Clarendon Golding Hyde (chairman), Mr. Arthur Balfour, Sir James Martin, Mr. A. A. Pugh and Mr. W. J. U. Woolcock. The secretary is Mr. W. H. L. Patterson, to whom all communications relative to the committee should be addressed at the Board of Trade, Great George Street, S.W.1. This, we believe, is Mr. Woolcock's first association with a gas problem, but the expert information he will be able to draw upon should sufficiently qualify him for judging fairly between the gas companies and their critics.

Points from our News Pages

- Dr. E. B. Maxted, in a special article, describes some recent work in the mechanism of catalyst poisoning (p. 816).
A description is given of a new process for the direct utilisation of rubber latex (p. 819).
A visit to Washington is described by Mr. F. E. Hamer in the fifth of his "Chemical Age" letters from America (p. 820).
In his second Cantor Lecture, Professor Bone dealt with the treatment of brown coals and lignites (p. 821).
The Chemical engineering side of paper manufacture was dealt with in a lecture at Manchester (p. 822).
Our London Market Report (which includes a new section dealing with pharmaceutical chemicals) records a slight improvement over last week and a tendency towards higher prices (p. 831).
According to our Scottish Market Report, there has been very little change in the position, except for slight reduction in the maker's prices for soda crystals (p. 833).

The Calendar

Dec. 11	Royal Society of Arts: "Brown Coal and Lignites." W. A. Bone. 8 p.m.	John Street, Adelphi, W.C.2.
12	Hull Chemical and Engineering Society: "British made Dyes for Paints and Distempers." G. B. Shaw. 7.30 p.m.	Hull Photographic Society's Rooms, Park Street.
12	Northern Polytechnic Institute Chemical Association: "Chemists and Costs." F. M. Potter. 8 p.m.	Holloway, N.7.
13	Society of Glass Technology 2.30 p.m.	University College, Gower Street.
14	The Chemical Society: "The Metallurgical Applications of Physical Chemistry." Professor C. H. Desch. 8 p.m.	Institution of Mechanical Engineers, Storey's Gate, S.W.
15	The Society of Dyers and Colourists. (Manchester Section). Papers by Professor A. G. Green, and K. W. Saunders and Professor E. Knecht and J. P. Egan. 7 p.m.	Literary and Philosophical Society Rooms, 36, George Street, Manchester.

Some Recent Work on the Mechanism of Catalyst Poisoning

By E. B. Maxted, D.Sc., Ph.D.

THE general recognition of the technical importance of catalyst poisoning probably dates from the development of the contact process for the production of sulphur trioxide. Here, for the first time in commercial practice, a catalytic reaction, extremely susceptible even to minute quantities of poisons, had to be carried out with materials containing, in the first instance, appreciable quantities of foreign constituents prejudicial to the reaction; and on the recognition, and, above all, the removal, of the poisons present, depended the technical success of the method. Since this time, a number of other processes, such as the catalytic hydrogenation of oils, and the synthesis of ammonia, dependent on similar factors for their industrial realisation, have been introduced and, like the sulphuric acid contact process, have grown into industries of the highest importance.

In considering a tabulated list of catalytic reactions susceptible to poisoning, the first point which forces itself upon the notice is that the phenomenon in practically every case occurs only in heterogeneous systems; and since, in order that a catalyst may participate in a given reaction in any way—save, possibly, by imparting or receiving energy by radiation—free contact between the catalyst, on the one hand, and the various components of the reacting system, on the other, is necessary, the earliest and most obvious conception of the function of a poison is that it acts by masking the catalytic surface, and in this way preventing the necessary free contact between the reactants and the catalyst. This explanation, which has been amply confirmed by later work, appears to have been recognised in a tacit manner by Faraday, who distinguishes between a clean and an obscured platinum surface. Faraday describes, for instance, experiments to show the manner in which a platinum plate may be rendered inactive for the combination of hydrogen and oxygen, not only mechanically, by a film of oil or grease, but also by the presence of certain foreign gases. A simple modern example of poisoning of a purely mechanical nature may be obtained by hydrogenating oleic acid in the presence of a suitable metallic catalyst at a temperature considerably below the melting point of stearic acid, when the film of stearic acid formed gradually obscures the catalytic surface and causes the cessation of further absorption of hydrogen long before the saturation of the oleic acid. The poisoning effect is thus, in this instance, obtained mechanically, even in the presence of pure reactants unmixed with any substance which, by reason of its composition, acts as a poison; and, on raising the temperature above the melting point of stearic acid, a normal non-poisoned curve is at once obtained. In a somewhat similar manner, the tarry by-products, which are formed during the hydrogenation of many organic bodies by the vapour method, gradually form a film over the surface of the catalyst, and in this way inhibit its activity. Examples of this effect are common in the literature relating to Sabatier and Senderens' early work.

A typical obstructive gas film, particularly for catalytic hydrogenation, is carbon monoxide. Taylor and Burns¹ have published results showing the tenacity with which carbon monoxide films are held by platinum black. It is interesting to note that even small proportions of carbon monoxide in hydrogen are preferentially adsorbed by catalytically active platinum, and probably also by other metals, the quantity of poison necessary to form an obstructive layer being relatively small. In certain cases, the inhibitor is removed by conversion to methane on treating the poisoned catalyst with hydrogen free from carbon monoxide.

This removal of an obstructive film of carbon monoxide by conversion into a less strongly adsorbed form is reminiscent of the recovery in activity of platinum, previously poisoned with carbon monoxide, when used for the decomposition of hydrogen peroxide,² save that, in this latter case, the inhibitor is converted by oxidation into carbon dioxide. Many other examples could be given, but, in any case, it would seem to be established that the most frequent, if not the universal, cause of poisoning in heterogeneous systems consists in the formation of an obstructive film of some sort on the surface of the catalyst, with or without penetration of the poison into the mass of the catalyst, in contradistinction to adsorption on the surface only. Apart from the purely obstructive conception, poisoning may also be viewed as a state in which the secondary valencies of the catalyst, in place of being free for transitory association with one or more of the reactants—the probable mechanism of catalysis when unaccompanied by the formation of definite intermediate compounds—are already saturated with the poison.

Starting from the above standpoint, namely that catalysis is effected by the association of the catalyst with one or more of the components of the reacting system, in such a way that this component is changed into a form which more easily reacts with the other components than while in its normal condition—i.e., than when unassociated with the catalyst—it follows that a poison should, in the course of inhibiting the catalytic reaction, also inhibit this association between the catalyst and the reactant.

In catalytic hydrogenation, for example, the reason for the increased activity of the hydrogen is undoubtedly to be found in its change into the occluded condition by association with the metallic catalyst employed. If this occlusion is prevented, no activation should be observed, and, conversely, substances which inhibit catalytic activity should also inhibit the occlusion of hydrogen. De Hemptinne³ noticed that palladium, on being treated with carbon monoxide, no longer absorbed hydrogen. Carbon monoxide has been shown by Paal and Hartmann⁴ to inhibit the activity of palladium for catalytic hydrogenation. Mercury, which is also a very pronounced hydrogenation poison, will even inhibit the occlusive power of palladium for hydrogen to such an extent⁵ as to cause the evolution of hydrogen from palladium which has been previously charged with the gas. The author⁶ has shown that hydrogen sulphide, while inhibiting catalytic activity, also inhibits the occlusion of hydrogen by palladium. In this case, the relation between the occlusive power and the poison content was followed quantitatively, it being found that the depression in the occlusive power of the palladium for hydrogen was a linear function of the sulphur content of the catalyst. Hydrogen sulphide was, further, within certain limits, quickly and quantitatively absorbed by the palladium, and was dissociated by this into sulphur and hydrogen.

Since catalyst poisons operate by obstructing the catalytic surface, it follows that they should be strongly and preferentially adsorbed by the catalyst. This has been confirmed experimentally for a number of cases. Thus, Bancroft⁷ states that platinum adsorbs carbon monoxide,

¹ Taylor and Burns, J. Amer. Chem. Soc., 1921, 43, 1273.

² Bredig and Ikeda, Z. physikal. Chem., 1901, 37, 1.

³ De Hemptinne, Zeitschr. f. physikal. Chem., 1898, 27, 249.

⁴ Paal and Hartmann, Ber., 1910, 43, 243.

⁵ Paal and Steyer, Ber., 1918, 51, 1743.

⁶ Maxted, J. Chem. Soc., 1919, 115, 1050; 1920, 117, 1280.

⁷ Bancroft, J. Physical Chem., 1917, 21, 734.

hydrogen and methane in decreasing order of preference. Carbon monoxide, by virtue of this preferential adsorption, occupies the surface of the platinum in such a way as to obstruct the adsorption of hydrogen. Hydrogen sulphide, in moderate amount, is absorbed by palladium to a degree sufficient to reduce the partial pressure of this gas in the absorption system to a very low value. Arsenic compounds and other poisons are strongly adsorbed by the catalysts used in the contact process for the manufacture of sulphur trioxide. Many other examples of the strong and preferential adsorption of poisons could be given.

Certain exceedingly interesting cases of poisoning are known, however, in which the poisoning of a catalyst for a given reaction would appear, at first sight at any rate, to take place by virtue of the possibility of a preferential reaction in which the poison is concerned, rather than by any process of obstructive adsorption. Well-known examples of this class are the inhibitive effect of free sulphur vapour in the catalytic oxidation of sulphur dioxide to trioxide, and the influence of traces of oxygen in the synthesis of ammonia. On considering these and similar instances somewhat more carefully, however, it is seen that, since adsorption or another form of association between the catalyst and one or more of the components of a reacting system is essential in order that catalysis may proceed, this preferential reaction of the poison itself is a necessary consequence of the presence of an inhibitor which is not only preferentially adsorbed, but is also capable, while in this condition, of reacting with a component of the main system, the interaction of which it impedes, not by its reaction in this way, but by virtue of obstructive adsorption as before. The apparent additional class of inhibition therefore merges into the general class characterised by the obstruction of free contact between the catalyst and the potential reacting system. Catalysts poisoned by the type of inhibitor dealt with in this paragraph—should the product formed by the reaction of the poison be one which is not strongly absorbed or which is otherwise innocuous—show normal activity on being subsequently treated with a system of poison-free reactants, whereas, in ordinary cases of poisoning, the catalyst remains inactive even for a pure system. Thus, while, as already stated, the activity of platinum for the conversion of sulphur dioxide to trioxide is diminished by the presence of free sulphur, the catalyst is found to act normally on being used subsequently for a system containing no free sulphur.

It may be of interest at this stage to consider the progressive poisoning of a catalyst by increasing concentrations of the inhibitor. In the first place, it is to be noted that, as might be expected, the harmful action of a trace of poison is strictly limited; and that, moreover, a very definite relationship would appear to exist between the concentration of the poison present and the decrease in activity of the catalyst. This subject has been examined recently for a number of poisons,¹ it being found that, within certain limits, the decrease in the activity of the catalyst is a linear function of the poison content. This may be illustrated by the typical poisoning diagrams reproduced in Fig. 1, in which the effect of mercury and of sulphur respectively on the activity of a platinum catalyst for the hydrogenation of oleic acid has been plotted. In the diagram, ordinates represent the relative activity of the platinum, measured by the initial rate of fixation of hydrogen, while abscissæ represent milligrams of the poison. In order to economise space, the two poisoning curves have been plotted on the same diagram, the concentrations of mercury and of sulphur respectively being indicated by Scale I and Scale 2 along the horizontal axis. The weight of platinum subjected to the action of the inhibitor was

5 milligrams in each case. It will be seen that a linear connection between the activity and the poison content exists up to a certain concentration of poison, at which point a

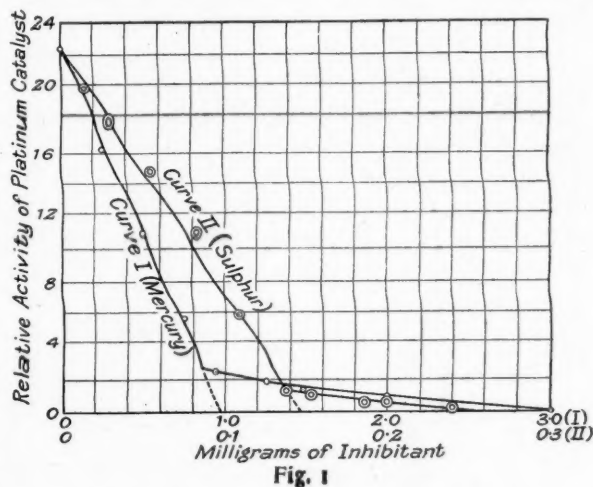


Fig. 1

break in the curve occurs, and the poisoning diagram then slopes far less steeply towards complete inactivity. Very similar results were also obtained for the influence of various inhibitors on the activity of platinum for the decomposition of hydrogen peroxide. It is, however, of course, necessary, in order that this linear relationship shall be obeyed, that the poison should be such that its effective concentration does not change, by reaction or otherwise, during the course of the reaction catalysed. It is to be noted, further, that the susceptibility of a given weight of catalyst to a poison depends on the surface exposed, that is to say on the ratio between the effective catalytic surface to the actual weight of catalyst. The susceptibility to poisoning thus changes with the fineness of division of the catalyst. This is to be foreseen on general principles, since poisoning is essentially—or at any rate primarily—a surface effect. This result corresponds with the well-established observation in heterogeneous catalysis that the activity of a given weight of catalyst is, other things being equal, dependent on the surface exposed rather than on the actual weight present.

A further point of interest is that, with a given and constant concentration of poison below that required for the complete suppression of the activity of the catalyst, the general form of the reaction curve does not appear to be changed. Under such conditions, the activity of a portion merely of the catalyst would seem to be prevented, while the remainder of the catalyst functions normally. Fig. 2, which is given as an instance of this, shows a series of reaction curves for the hydrogenation of oleic acid in the presence of 5 milligrams of platinum poisoned by various small concentrations of arsenic and of mercury. It is seen that the normal linear reaction curve given by an unpoisoned catalyst is also obtained in the presence of inhibitors, the slope towards the time axis being, however, of course, affected by the poison. The volume of oleic acid taken for the experiments summarised in Fig. 2 was 3 c.c. in each case. Similarly, the unimolecular reaction curve followed during the catalytic decomposition of hydrogen peroxide is not changed in type by the presence of a poison, provided that the concentration of the inhibitor does not vary during the progress of the reaction, and that no progressive adsorption takes place during this period, in such a way that the concentration of the poison on the catalyst becomes changed. This result is noteworthy in view, for instance, of the fact that the reaction curves obtained

¹ Macted, J. Chem. Soc., 1920, 117, 1501; 1921, 119, 225; 1922, 121, 1760.

during the hydrogenation of technical glycerides or fatty acids is not of the normal form given above for the hydrogenation of pure oleic acid (see the type of graph given in Fig. 2 for an unpoisoned catalyst), but is curved in form ;

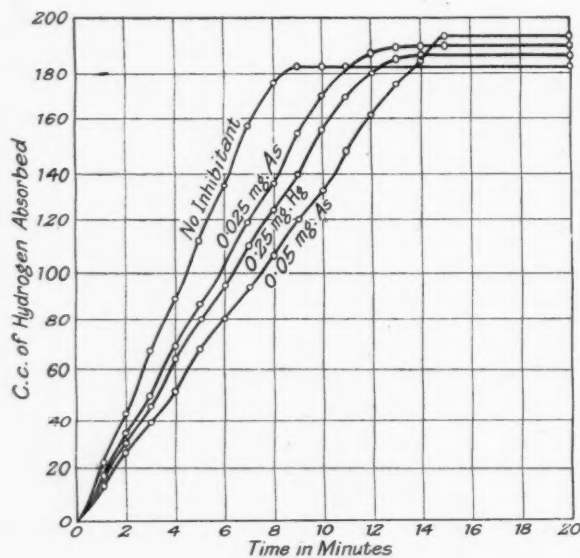


Fig. 2

indeed, the true form of the hydrogenation curve for pure substances has only quite recently been demonstrated as a result of the work of Armstrong and Hilditch,¹ it being previously thought that the course of the unpoisoned reaction was unimolecular. Since the presence of constant concentrations of poison should not affect the type of the reaction graph, the factors causing the form of curve usually obtained with technical oils would seem to merit special examination. A possible explanation may, perhaps, be found in the gradual decomposition of albuminoid sulphur compounds by the action of the catalyst, with formation of traces of hydrogen sulphide, or, alternatively, in the gradual formation of a film of metallic soap on the surface of the catalyst, whereby free contact with the reacting system is prevented. In any case, it is interesting to note that while, with a catalyst such as nickel, a linear reaction graph is obtained for the hydrogenation of a pure glyceride at relatively low temperatures, this becomes gradually transformed into a non-linear curve on raising the temperature. In a series of experiments² carried out under similar conditions on the hydrogenation of pure olein in the presence of a nickel catalyst at temperatures ranging from 80° to 200° C., in intervals of 20°, also at 225° and 250°, a linear graph, of a somewhat similar form to that previously illustrated in Fig. 2 was obtained at 80° and 100° C. At 120° slight curvature began, and this curvature increased progressively as the temperature at which the experiment was carried out was increased. Especially in the case of difficultly reducible catalysts, such as nickel, it is probable that the formation of a film of metallic soap has much to do with the decrease of activity and with the degeneration of the linear course into a curve. In the case of the platinum metals, however, it would be expected that a soap, if formed, would be immediately reduced to metal. It is known, moreover, that traces of albuminoids contained with the natural oils are decomposed by the action of catalysts, with formation, as already stated, of hydrogen

sulphide, and that the velocity of this decomposition increases with increase in temperature, so that cumulative sulphide poisoning may also be contributory to the effect observed. In any case, the degree of curvature, represented by the rate of change of slope of the tangent to the curve at any point, probably represents the rate at which the catalyst is being poisoned. This, of course, does not apply to the portion of the curve which is in the immediate neighbourhood of the point of saturation, and, consequently, beyond the main linear portion of the normal unpoisoned graph.

Finally, treating the subject of catalyst poisoning generally, it may be noticed that the inhibitive action of reputedly poisonous elements depends not only on the form in which the element is present, but also on the reaction catalysed and on the catalyst. Thus, arsenious oxide, which is a very pronounced inhibitor for catalytic hydrogenation in the presence, for instance, of platinum—probably by reason of its reduction to arsine—is relatively innocuous towards the activity of the same catalyst for the decomposition of hydrogen peroxide. Similarly, bismuth, which is a strong poison in catalytic hydrogenation, functions as one of the most active promoters of the activity of iron for the oxidation of ammonia to nitric oxide. Further, while sulphur in the sulphide form and phosphorous as phosphine act inhibitably on the course of catalytic hydrogenation, sodium sulphate appears to have no effect¹, and calcium phosphate has even been used as a promoter² for nickel in this reaction.

ZIRCONIUM AND ITS COMPOUNDS. By PROF. F. P. VENABLE.

The Chemical Catalog Co., Inc., New York. Pp. 173. \$2.50c.

This book forms one of the series of monographs which is being issued by the American Chemical Society. Its first purpose is to furnish an up-to-date account of the chemistry of Zirconium "in a readable form, intelligible to those whose activities may be along a wholly different line." To this class of reader it is not likely that the monograph will prove very fascinating, for, although some enthusiasts may demur at the statement, there is much to be said for Dr. Caven's remark that it would be difficult for any chemist to be enthusiastic about Zirconium.

Its second purpose is "to promote research by furnishing a well digested survey of the progress already made" in the study of Zirconium, and "by pointing out directions in which investigation needs to be extended." In the capable hands of Professor Venable, who has made a special study of the chemistry of Zirconium, this has been carried out in an admirable manner. The presentation of the subject-matter is clear, concise and critical. It is, however, to be regretted that the analytical chemistry of the element has not received more extended treatment, for it would have been of great assistance to new workers in this field. An interesting and particularly useful section of the book is the bibliography of the patent literature, in which nearly one hundred patents are listed and briefly described; this is in addition to the ordinary bibliography, which extends to more than eight hundred titles.

The success which has already attended the industrial use of Zirconia in furnace work and in the manufacture of refractories warrants the belief that the commercial uses of Zirconia and other Zirconium compounds will be considerably extended in the near future, and to all those interested in this subject the present volume may be confidently recommended.

H. T.

¹ Armstrong and Hilditch, Proc. Roy. Soc., 1919 (A), 96, 137, 322.

² Maxted, J. Soc. Chem. Ind., 1921, 40, 169T.

¹ Moore, Richter and Van Arsdel, J. Ind. and Eng. Chem., 1917, 9, 451.

² Bosch, Mittasch and Schneider, U.S. Pat., 1215335.

A New Rubber Process

The Direct Utilisation of Latex

A NEW process which, it is anticipated, may have far-reaching effects in the rubber industry is based on an invention by Dr. Philip Schidrowitz, of which the essential feature is that crude rubber in latex form can be converted into vulcanised rubber, without coagulation taking place and by simple and inexpensive methods.

Interviewed by a representative of THE CHEMICAL AGE at his laboratory in Chancery Lane, London, Dr. Schidrowitz said the chief points of the process were its extreme simplicity and cheapness; moreover, its industrial applications were equally simple. As the result of numerous experiments he estimated that the cost of producing vulcanised rubber by this process would vary—according to the purpose for which it was intended—from one-quarter to one-third of that of the present methods.

Questioned as to the nature of the process, Dr. Schidrowitz said that pending the publication of various patents he was not at liberty to disclose the exact details, but it might broadly be said to comprise the submission of rubber latex to vulcanisation with suitable vulcanising agents, under such conditions as to preclude coagulation. No complicated or costly plant was required, and the process was applicable either to fresh or to preserved latex.

Applications of the Process

Producing a remarkably varied range of samples of fabrics proofed by the new process, Dr. Schidrowitz said that many materials which could not be treated at all or only with difficulty by other methods were readily handled, the cost being estimated at about one-third of the present cost. He showed how the flimsiest materials such as butter muslin, mosquito nets, chiffons, etc., could be treated with ease, and demonstrated the remarkable elasticity imparted to the fabrics. Having outlined the many operations necessary with the ordinary means of proofing fabrics by means of rubber, Dr. Schidrowitz informed our representative that only one simple operation is involved where vulcanised latex is used. The fabric is run through a bath containing the liquid and the water is then dried off, leaving the material properly proofed; either one or both sides of the fabric can be treated and the introduction of dyes presents no difficulties. One advantage of the new method, continued Dr. Schidrowitz, was that it obviously produced far more durable films on the fabric than those made by the ordinary process, as it had not been treated with acid or rolled or masticated, it had not been affected by power and heat, and it had not been subjected to the injurious effects of the different methods of curing.

In reply to our representative's question as to other possible applications of the process, Dr. Schidrowitz said they were very numerous. In support of his contention he produced samples of a bewildering array of materials all of which had been treated with vulcanised latex. There was, he said, a very large field for the treatment of cords or fabric for tyres, as every individual fibre of the cotton was impregnated; this treatment was not practicable with ordinary rubber solution on a commercial scale.

Manufacture of Solids

Our representative was then shown samples of crepe soles and similar goods, which, it is claimed, can be produced both simply and cheaply by the new method. Instead of being submitted to coagulation, washing, drying, mastication, and vulcanisation, the vulcanised latex is simply coagulated, and the coagulum is handled just like ordinary latex coagulum.

Having outlined the possibilities of the process in the proofing of ropes, cords, strings, nets, etc., Dr. Schidrowitz said he had found that vulcanised latex is an excellent adhesive. An important application of this property would, he said, be in the display of posters, bills, etc., on hoardings, as it acted simultaneously as an adhesive and waterproofing agent. Advertisers would thus be saved the considerable expense which was now entailed by the frequent replacement of posters damaged by rain. In order to test the possibilities of this novel application, a poster pasted on wood with the vulcanised latex was immersed in water for a period of 16 hours, without being visibly affected, either as regards adhesion or appearance.

With regard to the transportation of the vulcanised or ordinary latex from the plantations, Dr. Schidrowitz said that this was quite a simple matter as it was readily transported and lasted extremely well. For most ordinary purposes it would be handled in iron tanks or drums, and if it was intended for proofing delicate fabrics, it would preferably be contained in enamelled tanks.

Lubrication Problems

Some Recent Researches at Teddington

THE Thomas Hawksley Lecture, delivered before the Institution of Mechanical Engineers, on December 2, by Dr. T. E. Stanton, F.R.S., gave an account of some recent researches upon lubrication at the National Physical Laboratory. These were largely the outcome of the discussion on lubrication which took place before the Physical Society in November, 1919.

Dr. Stanton first explained the inadequacy of Osborne Reynolds' theory of lubrication published in 1886, to explain all the observed facts in the practice of lubrication. After dealing with the main considerations which have led to a modification of the older view, the author said the main object of the experimental investigation at Teddington was to obtain more complete knowledge of the pressure distribution and the relative attitude and distance apart of the surfaces in cylindrical bearings, and to carry out these observations over as large a range of oil pressures as possible, with a view to tracing any transition from "boundary" to "perfect" lubrication due to the gradual reduction in thickness of the film with increasing loads. It was also hoped to obtain further light on the problem of the seizing of cylindrical bearings, and, if possible, to determine whether this phenomenon must be regarded as a limiting case of perfect or boundary lubrication. A special apparatus was designed for the purpose, and Dr. Stanton, after giving details of the work done, said that the tests were considered to have demonstrated the existence of perfect lubrication of the type assumed by Reynolds under conditions of supply of lubricant, intensity of fluid pressure, and distance apart of surfaces which had not hitherto been considered as likely to be associated with this type of lubrication. The closeness of approach of the surfaces in the present experiments was a feature of interest. In the case of Tower's experiments with olive oil, the least distance apart of the surfaces was calculated by Reynolds to be 0.00072 in. Assuming perfect geometrical and dynamical similarity, the corresponding distance in the present experiments would be 0.00018 in. It was clear, continued Dr. Stanton, that the phenomenon of seizing was not a mere suggestion of the closeness of approach of the surfaces. Further, the results of the tests appeared to negative the existence, in cylindrical lubrication, of a transition from a condition of perfect lubrication to one of boundary lubrication, as the intensity of oil pressure increases and the surfaces approach closer together. All the evidence appeared to show that apart from what happens in the case of new bearings which are being "run in," the condition of lubrication of a cylindrical journal, when they have become steady, are of the Reynolds type right up to the seizing pressure.

Formation of Separating Film

The manner of formation of the separating film was still, however, obscure, and no satisfactory explanation suggested itself of the fact that a film of the Reynolds type was more easily brought into existence with fixed oils than with mineral oils of the same viscosity. It might be that owing to the chemical constitution of the fixed oils a state of boundary lubrication was set up which eventually developed into the perfect type, but in the present state of knowledge this was purely a matter of conjecture.

As regards the practical value of these experiments, Dr. Stanton said the results appeared to indicate a possible solution of the problem of the application of the principle of the Michell thrust block to conditions of cylindrical lubrication which, as far as he was aware, had not yet been solved.

At the close of the lecture it was announced by Dr. Hele-Shaw that the Research Committee of the Institution had unanimously recommended the appointment of a committee to report upon the present position of lubrication in the hope of bringing out the practical side of the research work that had been done.

"Chemical Age" Letters from America.—V.

The Public Place of Chemistry—The Tradition of "Service"—Two Types of Chemists—Dr. Stratton's Resignation—Nitrogen Fixation Research

Cosmos Club, Washington.

Two and a half days, busily as they were occupied, is much too short a period to inspect with any thoroughness the great departments of science whose headquarters are at Washington, but, thanks largely to the good use made of the time by my two guides—Mr. R. S. McBride and Mr. H. C. Parmelee—one was able to gain some broad idea of the scale and spirit of the work. Mr. McBride's former experience as a member of the Government chemical staff is serving him well in his journalistic work and has already made him a recognised, though unofficial, liaison officer between chemical interests and the public. Mr. H. C. Parmelee, newly elected as president of the National Conference of Business Papers Editors, has also done much through the periodical conferences at Washington between the Secretary for Commerce (Mr. Hoover) and the trade and technical editors to link up official with scientific and commercial interests. The departments visited included the following:—

Bureau of Chemistry.—Under the guidance of Dr. W. W. Skinner, acting scientific director of the Bureau of Chemistry, Department of Agriculture, a visit was paid to many of the research laboratories in the Washington headquarters and to the colour laboratory located on the experimental farm at Arlington, Va. The work described included leather and paper, sugar, wool scouring, by-products, microchemical methods, essential oils, dyes and colours, and the manufacture of corn-cob by-products.

Bureau of Soils.—At the Arlington Farm there was visited the phosphoric acid plant which has been used for experimental work on making this acid from low-grade phosphate rock. The officials met were Dr. R. O. E. Davis, Dr. W. H. Ross and Dr. W. H. Waggaman.

Bureau of Standards.—A number of the physical, chemical and industrial laboratories were inspected. Dr. S. W. Stratton (director), Dr. W. F. Hillebrand (chief chemist), and Dr. G. K. Burgess (chief metallurgist) were among those consulted.

Fixed Nitrogen Research Laboratory.—This was inspected under the guidance of Dr. F. G. Cottrell and Dr. J. M. Braham.

Bureau of Mines.—With Dr. L. I. Shaw, assistant to the chief chemist (Dr. Moore, who was absent), a number of the offices and the chryogenic laboratory were inspected. Among others met were Dr. H. Foster Bain, director, and Mr. O. P. Hood, chief mechanical engineer (in charge of fuels research).

One would like to give a detailed description of the work carried on in all these sections, but that would require a volume, and all that is possible here are a few general impressions.

Public Recognition of Chemistry

The first point that strikes one is the public recognition of chemistry and the other sciences implied in their location among the Government buildings of the capital. A visitor to Whitehall would instantly recognise the War Office, the Treasury, the Board of Trade, and similar departmental offices. If he wanted to find the Department of Scientific and Industrial Research he would have to search through some old London by-ways, and when he found it he would not be impressed with its dimensions; if he sought for a British Bureau of Chemistry not even a London policeman could direct him. In Washington it is different. The sciences take their place with the other organised public services, and they gain accordingly in public estimation. The Bureau of Chemistry, or of Mines, or of Standards, is a national institution, with a recognised rank and dignified habitation, and the work of each is known throughout the United States.

In going through the various laboratories one was impressed afresh with the sharp distinction between the familiar two types of workers—one the technical chemist and nothing more; the other a technical man also, but possessed of some vision and capable of intelligent contact with outside interests. For the first type, the patient worker who concentrates on one particular problem or perhaps some fraction of a problem, one cannot but feel a profound respect. His docile submission to the drudgery, the restriction of mental interest to one narrow task, the entirely technical and unimaginative

spirit in which the work is pursued and the results recorded for others to make use of, have an element almost of religious dedication in them. It is essential work, but one feels that the true laboratory type will never be anything other than the laboratory type, needing others to apply and interpret the results he wins. These "others" are the men of wider vision, whose language is not exclusively the jargon of the laboratory and who can link up these chemical mysteries with all sorts of public utilities. This is the type one finds at the top, or at least somewhere near the top, acting as links between the chemical priesthood and the outside world. The two types have probably always been there, but one could not help reflecting on how much more interesting much of the work would be if the technical man engaged in it could see its ultimate bearings, and how little his work would come to without someone of wider vision and administrative gifts to apply it.

National Service

Not only are the public habitations of science here impressive in their external character, but they are recognised by the public as part of the national service. You can walk into one of the bureaux in Washington and ask for advice or information just as you ask a policeman to direct you to an address, and the information is given in exactly the same spirit. You can get to the man you want without the elaborate circumlocution of our Whitehall establishments. When I remarked to one of the senior officials on this, his reply was, "Well, what else are we here for? This bureau is not established and maintained for our private convenience, but for the service of the public, and the more extensive and effective our service is the stronger is our own position. Inquiries are welcomed by us, because they demonstrate the practical value of our work, and no matter how trivial they are they are promptly attended to. The more intimate our contact with the public, and especially with our industries, the more valuable our service becomes. Not only are inquiries welcomed, but our publicity services are organised for the purpose of making known through the technical Press and other means the results of our work." When this is contrasted with the close-fisted attitude of Government departments at home and of some of our leading societies, one realises how far behind we still are in some of our ideas and organisation.

The desire to be of direct service to industry has almost, in fact, become the exaggeration of a merit. I have, for example, heard some American authorities question whether commercial technology, as distinct from fundamental research, is not occasionally overdone. I can pronounce no opinion on this point, but merely mention it as an indication of American opinion. Another point on which I heard opinions expressed is the introduction of research scholars representing particular firms. It is true that the results are made public to all interested; at the same time the scholar is naturally in a position to keep his own firm more in contact with the work than others can be and to give them first information.

These, however, are mere details. The point to be emphasised is the great work that is going on with the authority and resources of the State behind it. I heard from Dr. Hillebrand an interesting account of what was being done in the establishment of standards. So much is this work appreciated in industry that the modest fees charged for standards have been sufficient to pay the cost of the work. The research work taken up during and since the war has led in such cases to excellent results, and I was told that porcelain and optical glass is now being produced equal, if not indeed superior, to the best products of foreign nations.

Dr. Stratton's Departure

At the time of my visit it was known that Dr. Stratton, the head of the Bureau of Standards, was leaving to become principal of the Massachusetts Institute of Technology, though no official announcement had been made. Dr. Stratton, when I saw him, made no concealment of the fact that the change would be to his own advantage, though I believe the sense of the opportunity offered by the new post has been a powerful

factor in determining his choice. Such a decision on the part of one of the finest scientific administrators in the service of the Government was being very much discussed at the time. Chemists in the public service seem quite prepared for the higher salaries paid by commercial undertakings, when they wish to secure a particular person, but they do feel that the Government should be able to keep pace with academical bodies, and seriously resent being left at a lower level than that of universities and technical centres. Dr. Stratton's departure will in many ways be a loss to Washington. The propositions he usually put up for the consideration of Congress were of so practical a character that he rarely failed to secure the necessary financial support, and the great organisation he has built up around him will remain the best memorial of his work here.

An Impression of Dr. Cottrell

One of the most interesting branches visited was the Fixed Nitrogen Research Laboratory, in charge of Dr. Cottrell and Dr. J. H. Braham. It says much for the enterprise of the U.S. Government that a man like Dr. Cottrell, combining conspicuous qualifications for research work with a rare idealism and enthusiasm, should have been set free to pursue these investigations along his own lines. Freedom is the only atmosphere in which a mind like Cottrell's can work, and the authorities have been wise enough to leave him free to work just as the spirit moves him. One has only to be with him for a few minutes to realise what a practical visionary your true scientist may be, and what fine human impulses may lie behind his will to extract more of Nature's secrets and apply them to the service of mankind. Here, then, is this really big man, whose abundant good humour and hearty laugh doeth good like a medicine hard at work on nitrogen fixation.

I asked him if he could say what were the results hitherto obtained, but the investigations are in too early a stage for definition yet, though progress in many directions has been made. The laboratory has devoted a considerable amount of attention to research on the Haber process, and particularly on the testing of ammonia catalysts. The apparatus and methods involved are too elaborate for detailed description. It may be said, however, that the laboratory claims to have solved with reasonable success the problems of securing a supply of pure nitrogen-hydrogen mixture for carrying out the tests, of introducing known concentrations of water vapour and carbon monoxide when the catalysts are to be tested against poisons, of controlling the temperature and velocity of flow during the test, and of eliminating temperature gradients in the catalyst samples under test. Up to the present the apparatus has been largely used for making tests on catalysts developed at the laboratory, although some testing has been done for outside companies, and the laboratory is always ready to carry out a reasonable amount of such experimentation. Although an enormous number of materials have been tried or patented as catalysts for ammonia synthesis, successful ones have all consisted of iron containing small additions of materials called promoters. These catalysts are in general prepared by the reduction of iron oxide containing the desired promoter substance. The oxide can be prepared either by precipitation or by the fusion of iron in an oxygen blast. The oxides may be reduced with the same mixture of nitrogen and hydrogen from which ammonia is to be formed, and, if desired, in the same bomb or converter in which the ammonia synthesis is later to be carried out.

One of the themes on which I found Dr. Cottrell very enthusiastic was the production of cheap oxygen for industrial purposes. There are, he feels, immense possibilities of development in this direction, comparable in commercial importance to the developments which followed the introduction of the steam engine and later of the electric dynamo and motor.

In closing this very inadequate sketch of the great work carried on in these science departments just two final points may be noted. First of all there is the great collective influence and stimulation which comes from the grouping of scientific staffs into a sort of community, the common life of which is constantly refreshed by interchange of ideas and experience. The next—and it is pleasant to record it—is the high respect in which the work of British chemists is held by their American colleagues, and the bond which science thus constitutes between the best minds of the English-speaking race on both sides of the water.

F. E. HAMER.

The Chemistry of Coals

Treatment of Brown Coals and Lignites

IN his second Cantor Lecture on "Brown Coals and Lignites," before the Royal Society of Arts, on Monday, Professor W. A. Bone dealt at some length with the difficulties associated with the utilisation of brown coals and lignites. Discussing means of drying raw coals containing 50 per cent. of water, Professor Bone said that mere air-drying was not likely to be economical on a large scale because it was far too slow, and dependent upon climatic conditions. Various artificial methods had been resorted to for the drying of lignites, all of which depended upon the use either of hot combustion products, hot air, or steam in various forms of drying plant. The cost of installing and running steam drum tube dryers was considerably less than that of the table oven type, but the drying operation as a whole could be better regulated and controlled in the latter type.

Low Temperature Treatment

Coming to the heat treatment of brown coals and lignites at temperatures below 400° C. as a possible method of enhancing their fuel values, Professor Bone referred briefly to his researches described in a previous paper before the Royal Society of Arts on this subject last February, as well as to subsequent researches, which showed that this treatment might be used as a means of upgrading these coals and improving their fuel values.

In experiments with a fairly mature lignite he had found that the temperature limit to which the dry coal could be heated without loss of either oils or hydrocarbon gases was 350° C., and that up to such degree 100 parts by weight of the dried coal lost 4.5 parts by weight of water and 4.5 parts by weight of gas. The gas evolved amounted to about 900 c. ft., measured at N.T.P. per ton, and it contained 73 per cent. of carbon dioxide, 25 per cent. of carbon monoxide, and 2 per cent. of nitrogen.

Dealing with the briquetting of brown coals and lignites, Professor Bone referred to the German system in which no binder was used and then referred to the most suitable binding agents, of which, so far, coal tar pitch was the best known. The best quality to use for the purpose was the "medium," and it should contain only from 0.25 to 0.5 per cent. of ash. Unfortunately, the supply of coal tar pitch was limited, and its rapidly rising cost was becoming a serious item in regard to the manufacture of briquettes. The minimum amount of pitch required to produce satisfactory results varied between about 5 and 10 per cent. of the weight of the finished product. In some cases the pitch-like residues from the distillation of petroleum oils had been successfully employed as substitutes, and in his experience such materials were practically as good as coal tar pitch for the purpose.

Water for Industrial Purposes

At a joint meeting of the Huddersfield Section of the Institute of Chemistry with the Huddersfield Engineering and Textile Societies, the Society of Dyers and Colourists (Huddersfield Section) and the West Yorkshire Metallurgical Society, Dr. H. T. Calvert, F.I.C., lectured on the subject of "Water for Industrial Purposes with special reference to Textile and Engineering Needs." Dr. Calvert said water was the most neglected of the raw materials of industry, and he considered that local sections, such as those of the Institute of Chemistry, should have a valuable educational value in letting local manufacturers know that there were those who by their training were qualified to attack, with every prospect of success, the problems of industry which daily presented themselves. Dr. Calvert gave an account of the sources of our water supply and the origin of the various impurities, the gases and insoluble matter derived from the atmosphere, and the mineral and organic matter derived from the passage over the surface of or through the varied geological strata of the earth, and various forms of life which, under suitable conditions, may multiply to such an extent as to be the cause of considerable trouble.

The storage of water and its purification were then dealt with. For steam raising the removal of suspended matter by coagulation and subsequent filtration, of hardness by the lime process of Clark, or by filtration through a layer of "Permutit" or "Doulcil" were described.

The Manufacture of Paper

Chemical Engineering Processes Involved

A JOINT meeting of the Chemical Engineering Group and the Manchester Section of the Society of Chemical Industry was held at the Textile Institute, Manchester, on December 1, Dr. E. Ardern presiding.

In a paper on "The Chemical Engineering of Paper Manufacture," Mr. W. G. Fraser, after detailing the principal raw materials, described in some detail the processes through which the material passed before it reached the pulp stage. In the case of rags, esparto and other grasses, there was the cleaning, cutting, boiling, bleaching and beating, and the machines employed differed according to the nature of the material being treated. If cotton and linen rags were used, the first process, the removal of foreign matter, was a purely mechanical one. The next operation might be described as a chemical one, and consisted of boiling the material with a certain amount of alkali, usually caustic soda, to remove the contaminating matters such as starch, china clay, or other loading materials.

The rags had then to be thoroughly washed to remove all the loosened dirt and any remains of the soda.

After outlining the operations of the beating process, the lecturer said the object of the beating was to effect a complete disintegration and separation of the individual fibres. The separation of the fibres into independent units freely floated in the suspended liquid was the first essential condition for realising their felting and inter-lacing qualities in the formation of paper. The second important condition for uniform felting was the development of the flexibility of the fibres, the softening or hydration effect whereby the fibres became flexible to combine with each other to form a uniform close web of paper. It was impossible in the case of linen, hemp, and cotton to separate the fibres by any ordinary beating process without disintegrating them. For strong papers it was necessary to avoid the cutting action as far as possible, the disintegrating or parting asunder being brought about by bruising or breaking the fibres, which added to their felting and strength-giving qualities.

When the pulp had been sufficiently beaten, size was added to give the paper water- or ink-resisting qualities, and mineral filling or loading to fill up the pores of the paper. Of the original weight of rags used, about 70 per cent. now remained, the remainder having disappeared as dirt, loading material and lost fibre.

The treatment to which wood pulp and other principal sources of fibre are subjected was briefly described, and the author then dealt with the construction and operation of the paper machine.

The quantity of water required in a paper mill was very great. For rag papers from 100,000 to 150,000 gallons of water per ton of paper might be used. For esparto grass from 40,000 to 50,000 gallons per ton of paper might be required. For news papers about 10,000 to 12,000 gallons of water per ton of paper was necessary. These figures included the water used in steam raising.

Apart from the steam used for power a very large amount was required for boiling and drying. For drying the papers an average of 3 lb. of steam per pound of paper might be considered usual. It was essential that not only should the steam be raised in the most economical manner possible, but that it should be utilised in the various processes to the best advantage.

In conclusion the lecturer said that problems arose as to whether it would be economical to pump the diluted mass from one operation to the other or concentrate the pulp and effect its removal by mechanical means or manual labour. With the increasing expense of manual labour the paper-maker was faced with many problems during the various stages of manufacture, of which the question of economical steam raising and the utilisation of this power was an extremely important one.

Discussion

The CHAIRMAN asked whether any experimental work had been done with regard to the relation of the law of higher vacuum in regard to the speed at which the paper could be taken over the vacuum boxes and made into a condensed mass.

Mr. J. A. REAVELL said that in Norway and Sweden, a great deal of attention had been directed towards the efficient boiling of pulp. In one or two cases, he believed the time had been cut down to something like 70 per cent., which would make a material reduction in the number of boilers used, even though it involved a great deal of power in pumping through high-speed heaters.

Mr. HUEBNER suggested that Mr. Fraser should give further details with respect to the power and steam consumption of the various parts of the machinery employed. Another point was what was the most suitable size of beater roll, and how did the diameter and the weight affect the beating as distinguished from cutting. Also, would the lecturer give a comparison between the suction boxes and suction rolls, first of all from a mechanical point of view and, secondly, as regards effect on the structure of the sheet, the removal of loading materials and size, and the strength and the elasticity of the sheet, ultimately, which was formed by passing over suction rolls or suction boxes.

Mr. T. T. POTTS said he understood that the system of using bleaching tanks had now been superseded to a great extent. With regard to water consumption, R. Clayton and Sons, of Stoneclough, used, on the average, about 100,000 gallons of water per hour for 120 hours per week, and this water was taken from the River Irwell. The problem of preparing that water for the paper mill was mainly a chemists' problem. The water was twice passed through mechanical filters before it was used. Permanganate "bleach" was most efficient but expensive, so that papermakers had to stick to the old bleaching powder. The papermakers' greatest problem was the hydration of cellulose incorporated chemically with the water used in the beating process. "Wetness" or "freeness" were not necessarily a measure of hydration.

Mr. JOHN ALLAN pointed out that the lecturer had mentioned that various raw materials of paper were, in certain cases, prepared by digesting them with caustic soda solutions, 5 per cent. of 90 per cent. caustic soda being used. Although the quantities used in the "boils" had been given, there was no indication of the actual strength of the solutions in which the materials were digested. He had had some occasion to observe the effect of continued heating, under pressure, of caustic soda solutions upon the metal parts of plants, and in one particular case he had in mind, under pressures up to about 30 lbs., the rivet heads became so brittle they could be knocked off with a hammer shaft.

Mr. MALPAS inquired to what extent liquid chlorine was used for bleaching pulps.

Mr. FRASER, replying to the discussion, said that he had endeavoured to make the lecture a popular one, with the object of stimulating interest in the Chemical Engineering Group on papermaking subjects. He understood the Group wished to take up the matter seriously. The amount of suction that could be used was limited by the fact that suction caused considerable friction on the wire band conveyor for the pulp. The relative advantages of suction boxes and suction rolls were too wide a subject for him to enter into, except in a separate lecture. He had, personally, not known of any instances of corrosion by caustic soda in paper-making plant. Liquid chlorine was not used to any great extent in this country for paper bleaching purposes.

Commercial Production of Potash from Kelp

Not only is there every indication that the kelp-potash plant established by the U.S.A. Bureau of Soils for experimental purposes at Summerland, California, will be a permanent commercial enterprise, but plans already are being made for its enlargement. The plant, states *Chemical and Metallurgical Engineering*, was purchased by the United States Kelp Products Co., after it had been operated for experimental purposes by the Bureau of Soils since 1917. Potash is now being produced at the plant at the rate of 5 tons a day. The principal product, however, is kelp char, which is in much demand as a substitute for bone-black as a bleaching agent. Mr. J. W. Turrentine, who was in charge of the plant for the Department of Agriculture and who has been in charge of its operations since their inception, has returned to Washington to take up anew his research work on potash.

The Future of Chemistry

Dependence of Progress on Professional Efficiency

THE annual dinner of the Liverpool section of the Institute of Chemistry and the Society of Chemical Industry was held at the Liverpool Adelphi Hotel on December 2, Dr. F. J. Brislee, chairman of the Liverpool and North Western Counties Section of the Institute, presiding. The guests included Sir Max Muspratt, Dr. and Mrs. E. F. Armstrong, Mr. and Mrs. W. Hulme Lever, Dr. J. P. Longstaff, Mr. H. Ballantyne, Mr. R. B. Pilcher, and Dr. G. C. Clayton, M.P., and Mrs. Clayton.

Responding to the toast of "Our Guests" Dr. Armstrong said that now that Dr. Clayton had got into Parliament they hoped the lot of chemists would be materially improved. The presence of the Lady Mayoress and other ladies reminded him of the great influence of women on chemistry, because without them there would be but little demand for British dyestuffs and no use for aspirin. Many societies, he added, appealed to chemists, but none of them had made as much progress during the last five years as the Institute of Chemistry and the Society of Chemical Industry. He hoped they would come together in the future because he felt that if they spoke with one voice they would be able to take the position they aspired to.

The chairman, replying to the toast of his health, said it was during the war that chemistry was really discovered and found to be of national importance. They must not let the lesson be forgotten. Speaking of the principles of the two societies with which they were connected he said their sign manual was "professional efficiency." With such a combination he thought the progress of chemistry in this country was assured. In the future chemistry would play a far greater part in the economics of everyday life than in the past. One had only to look at the appalling waste of production through inefficient methods of manufacture—fuel need only be mentioned in that connection—to become convinced that a large amount of expert investigation was necessary to carry them to the golden age they hoped to reach in the future.

The Fertilising Value of Slags

A Modified Citric Acid Test

At a meeting of the London Section of the Society of Chemical Industry, on Monday, Dr. G. S. Robertson, F.I.C., and Mr. F. Dickinson read a paper on "The Valuation of Insoluble Phosphate by Means of a Modified Citric Acid Test," in which a plea was put forward for a modification of the present generally accepted test—referred to as the official test—for the valuation of insoluble phosphate. It was suggested that the present official citric acid test exaggerates the inferiority of the lower citric soluble slags, and that the results from pot experiments, upon which the 5-gramme test of Wagner was based, are not necessarily paralleled by the results obtained from field experiments.

The authors pointed out that since 1912 changes in the manufacture of steel developed with great rapidity, and that from 1914 onwards a new situation in this respect has arisen. The larger and ever-increasing proportion of basic slag produced was of low solubility, and the amount of high soluble slag is inadequate to meet agricultural requirements. Consequently, in order to facilitate the passage on to the market of the lower citric soluble slags, a modified test should be introduced. Describing the various phosphates now available, it was remarked that there is now much confusion in the minds of farmers as to their relative values owing to the fact that the official test did not, in the author's opinion, give the true result in many cases. The farmer has the choice of high-grade Bessemer slag containing 33 to 42 per cent. phosphate, which was practically all citric soluble, but there was not much of this available.

In the official citric acid test, 5 grammes of phosphate, 10 grammes of citric acid and 500 cc. of liquid are taken and shaken for 30 minutes, and the proposal of the authors was that 1 gramme of phosphate instead of 5 grammes should be taken. In support of this, figures were given which indicated that the 1 gramme solubility test gave results which more closely followed the field experiments than did the results from the 5-gramme test. It was admitted by the authors that this modified method had no scientific basis, but was a

rough-and-ready method of getting at the true value of the various phosphates on the market. With the exception of the Bessemer slag and the open-hearth slag, the results obtained with the 1-gramme test gave a uniformly higher value than the 5-gramme test, and it was further contended that an examination of the test figures brought out important distinctions, and that what was a low soluble slag under the 5-gramme test became a high soluble slag under the 1-gramme test, and that the farmer was enabled to make his choice much more easily if this test was adopted. It was, moreover, shown by the figures that the solubility of some of the best-known rock phosphates by the 1-gramme method approximated closely to the results obtained with the high-grade slags.

The speakers in the discussion were generally agreed that the matter ought to be inquired into, at the same time pointing out that this was a very complicated question, and that with the increase in knowledge during recent years factors other than mere solubility would have to be taken into account.

Pan de Azucar Nitrate Co.

Surplus Stocks in Consuming Centres

PRESIDING, on December 1, at the annual meeting of the Pan de Azucar Nitrate Co., Ltd., Mr. H. C. Gibbs (the chairman) said that no nitrate was manufactured at the oficina during the period covered by the accounts, the stocks brought over from the previous year having been ample. The oficina remained closed, and was not likely to be reopened during the present financial year. At July 1, 1921, they had stocks of 313,877 Spanish quintals, and during the twelve months ended June 30, 1922, they shipped 132,000 quintals, for which the company received the average price of 15s. per quintal. At June 30 last they had an unsold stock of 181,422 quintals, practically all of which had since been sold and shipped, but nitrate sold for delivery after June 30 would not, unfortunately, bring them in 15s., as the price fixed by the Association was very much below that. The scale of prices for the nitrate year, July 1, 1922, to June 30, 1923, varied between about 8s. 6d. and 9s. 6d. per quintal f.o.b. It remained to be seen what average price would be secured by the Association for the current year's sales. Nearly half the year had gone by, and the average so far worked out at about 9s. 1d. per quintal f.o.b. If that average were maintained or reduced, they would make no profit on their stock of 181,422 quintals; in fact, there might be a small loss. Against this, however, must be placed revenue to be derived from allocations of sales to be made by the Association after completing the delivery of their manufactured stocks. They had contracted with another producer to take over from them these surplus allocations, for which they would receive payment at the rate of 11½d. per quintal. The directors could not estimate with precision what quantity of nitrate was likely to be dealt with under this arrangement, as that, of course, would depend upon the total sales made by the Association in the nitrate year ending June 30, 1923. Whatever figures they took for the total Association sales it seemed practically certain that their gross revenue must be small during the year to June 30 next.

The nitrate trade during the year under review was greatly hampered by the large stocks in consuming centres carried over from the previous year, and even on June 30, 1922, those stocks had not been entirely disposed of. So far as he could judge, there was very little prospect of the stock being brought down to anything like normal figures during the current nitrate year.

"Old Centralians"

A SMOKING concert was held at the Grand Hotel, Manchester, on December 1, to inaugurate a Northern District Branch of the "Old Centralians," the Old Students' Association of the City and Guilds' Engineering College, South Kensington. There was a good attendance and the Branch received a most enthusiastic and promising start. A local committee was elected, with Mr. J. P. Clifton, "Cargill," Springfield Road, Sale, as Honorary Secretary. The evening was a most enjoyable one, and the musical programme was much appreciated. It was decided to hold a meeting early in the New Year, and all old students living in the area are asked to communicate with the local secretary.

British Chemical Manufacturers

Complimentary Dinner to Mr. Woolcock

ON Thursday, November 30, Mr. W. J. U. Woolcock, C.B.E., general manager of the Association of British Chemical Manufacturers, was the guest of the evening at a dinner given in his honour at the Midland Hotel, Manchester, by the members of the Dyestuffs Section of Group IX of the Association. The Chairman of the Group (Mr. W. H. Dawson) presided over the function, which succeeded in a remarkable degree in achieving its prime object—that of paying tribute to its guest.

In proposing the health of the guest of the evening the CHAIRMAN expressed the profound gratitude of the Group for the services rendered by Mr. Woolcock to the dyestuffs makers of Great Britain. Mr. Woolcock, he said, had played a major part in the promotion and administration of the Act which, in December, 1920, gave a new lease of life to the dyestuffs industry of this country. During the stormy periods supervening upon the passing of the Act he had, by his masterly handling of the situation in the House of Commons, by his tactful lead on the Licensing Committee, and by his untiring efforts to bring into the closest possible co-operation in the Association the individual dyestuff makers, piloted the industry through a series of crises to a position of greater security than had ever hitherto been enjoyed. (Cheers.)

Responding to the Toast, Mr. Woolcock sounded the keynote of co-operation. To-day all the dyemakers of Great Britain were contained in Group IX of the A.B.C.M. Practically nothing that had been attempted during the past four years could possibly have been achieved but for the solid front presented. What he wanted was the pre-eminence of the British dyestuff industry rather than that of any individual concern. The Association held a unique position among the trade associations of the country. He spoke in glowing terms of the infinite patience and determination of the members of the Group with whom he worked, and with just appreciation referred to a quotation which recently appeared in THE CHEMICAL AGE that "the centre of chemical industry, wherever it was before, is now located in Piccadilly."

E. A. B.

Structure of the Atom

A MEETING of the West of Scotland Branch of the British Astronomical Association was held on November 23, in the Royal Technical College, Glasgow, Mr. John J. Ross, F.R.A.S., president in the chair. Professor G. G. Henderson, F.R.S., delivered an address on "The Structure of the Atom." Commencing with a reference to Dalton's atomic theory, he stated it had been suggested by Prout that all elements were built up of hydrogen. When determinations of atomic weight became accurate it was seen that the atomic weights were not exact multiples of that of hydrogen. The periodic law exhibited a periodicity in the properties of elements, but the arrangement became perfect only when atomic number was taken as basis instead of atomic weight. Account was given of the discovery that elements could be obtained in states differing in atomic weight but identical in physical and chemical character. These were "isotopes," or mixtures of isotopes. The researches of J. J. Thompson, Aston, Rutherford, and Soddy were briefly described, and the idea to which they led as to the nature and arrangement of the components of an atom. It was probable that all matter consisted of at most two fundamental types of particle—electron and proton. The hydrogen atom had an atomic weight 1.007, the electron 1/1845th of this. The different elements were not probably evolved by a mere disintegration. It was possible to imagine that at an enormous temperature even the atoms might break up, and that by gradual or intermittent cooling there might be condensations, the ultimate particles combining to form the various elements.

Dinner to Mr. C. S. Garland, M.P.

ON Wednesday evening, in the rooms of the Imperial College Union, South Kensington, Mr. C. S. Garland, M.P., on the occasion of his recent election to Parliament, was entertained to dinner by the Royal College of Science Association (old students and staff). An account of the proceedings will appear next week.

"Overcrowding"

To the Editor of THE CHEMICAL AGE.

SIR,—In a letter in your issue of December 2 Mr. R. G. Johnston refers to the teaching of metallurgy in modern universities, and his observations call for comment.

There is at the moment a surplus of university trained metallurgists, but the fact should not be exaggerated. If, during the next three months, trade should improve so as to require 50 such trained men in the whole of the United Kingdom, there would be a distinct shortage. In the years preceding the war I received applications in excess of the numbers trained, and for months before the sessional examinations I kept a list of firms who had informed me of likely vacancies. The causes of the present surplus are as follow:

(1) During the war a large number of partially trained men were employed, and in the interval these have gained experience, and are occupying positions to which more fully trained men would have been appointed had they been available.

(2) Day course instruction for ex-service men was also given in technical schools, which led to partly trained men being available in a shorter period, and they were willing to work for lower stipends.

(3) In the ordinary course there were three main openings for metallurgical students—namely, the iron, steel and engineering trades; the non-ferrous industries; and the mining industry—chiefly in the colonies. Temporarily, two of these are closed—viz., the iron and steel trades and the mining industry.

We are now returning to more normal numbers, and though difficulty will doubtless be experienced in the immediate future, I anticipate that, in a few years, the prospects of metallurgical students will be at least as good as they were before the war.

Mr. Johnston states that in the newer universities, "If a student wishes to take metallurgy, he is taught all manner of things about the actual practice of the art, often to the neglect of the great underlying principles of all science." It should be stated that the course of study for a pass B.Sc. degree in metallurgy in the city from which Mr. Johnston writes, extends over three years; for an honours degree an additional year is required. One-third of the student's time is devoted to fundamental sciences, chemistry, physics and mathematics; one-third is devoted to subsidiary subjects, such as geology, higher mathematics, physical chemistry, engineering, etc., according to the course selected; while the remaining one-third is devoted to metallurgy. Since in that remaining one-third the whole of the theoretical teaching has to be included, it is clear that not much time can be devoted to the actual practice of the art.

The only important difference between the older method of teaching and that adopted in the newer Universities is due to the fact that additional facilities, improved apparatus and equipment are now provided. The modern metallurgist must be familiar with microscopes, pyrometers, and with many other appliances of the physicist and physical chemist.

The more specialised practical instruction is provided during the vacations, partly in our own laboratories, but chiefly by the kind assistance of many of the largest metallurgical establishments throughout the country. The practice of the art of metallurgy which our students are able to acquire does not take the place of, but is additional to, training of a general fundamental character, which must always remain the foundation of true scientific education.—Yours, etc.,

THOMAS TURNER.

Department of Metallurgy,
The University, Edgbaston, Birmingham.
December 5, 1922.

French Synthetic Ammonia Decision

IN connection with the proposal to nationalise the French synthetic ammonia industry, the Sub-Commission appointed to examine the text of the Bill, which it is hoped to pass into law before the New Year, has, according to the Paris correspondent of the *Financial News*, decided that the annual balance sheet of the proposed nationalised exploiting company need not be submitted to the Chamber and Senate, but simply to the Ministry of Agriculture for approval.

Chemical Matters in Parliament

Sodium Hyposulphite

SIR P. LLOYD-GREAME informed Mr. C. Roberts (House of Commons, December 4) that sodium hyposulphite is dutiable under the Safeguarding of Industries Act when it is of photographic quality, or of still higher quality. Photographic quality hyposulphite, he continued, was a well-known trade quality, but there was no fixed quantitative standard to which it must conform, and any hyposulphite which would be good delivery against an order for sodium hyposulphite, "photographic quality," was dutiable.

Potassium Permanganate

In reply to Mr. C. Roberts (House of Commons, December 4) Mr. Baldwin said he was informed that 80 drums of permanganate of potash, which arrived at the Salford Docks, *ex s.s. Stad Utrecht*, on October 2 last were declared on importation to be of commercial quality and, as such, free of duty. As there was reason to doubt the accuracy of the declaration, tests of representative samples were taken and, as a result, the goods were found to be of "R" quality and liable to Key Industry Duty. Instructions had now been given as to the conditions under which release of the consignment could be obtained.

Answering a further question by Mr. Foot, Mr. Baldwin said that duty was not charged on this commodity unless it was of "R" quality. If a claim for duty on a specific consignment was disputed, the importer could apply to have the matter referred to a Referee under Part II. of the Safeguarding Act.

Sulphocyanides

Answering Mr. Foot (House of Commons, December 4), Sir P. Lloyd-Greame said the items aluminium sulphocyanide, barium sulphocyanide, and copper sulphocyanide were removed from the lists because certain observations made by the Referee in the cream of tartar case indicated that he would probably regard the three chemicals in question as heavy chemicals. These observations did not apply to potassium sulphocyanide and sodium sulphocyanide, and accordingly the lists were not amended in respect of these two substances.

Anti-Dumping Applications

Replying to Mr. Lyle-Samuel (House of Commons, December 4), Sir P. Lloyd-Greame said that of the complaints under Part II. of the Safeguarding Act, fifteen had been referred to Committees for inquiry, and of these five had been the subject of Orders made by the Board of Trade; eight had been adversely reported upon; and in the two remaining cases the Committees' reports were under consideration.

Distribution of Reparation Dyes

In answer to questions by Mr. C. Roberts and Major McKenzie Wood (House of Commons, December 4), Sir P. Lloyd-Greame said the British Dyestuffs Corporation, Ltd., were appointed agents for the Board of Trade in respect of the distribution of reparation dyestuffs, as it appeared in all the circumstances a better arrangement than the existing one. The change took effect as from September 1 last, but a Press announcement was deferred until some modifications in the terms of sale of the dyestuffs could be included in it. The agreement with the Corporation was terminable at any time by three months' notice on either side. The Corporation received a commission of 6½ per cent. on the gross turnover plus a further 1 per cent. for guaranteeing accounts, and this commission covered all charges relating to the importation of the dyestuffs from Germany, storage in the United Kingdom, packing, etc., but the Board had agreed to make a maximum annual grant of £30,000 towards the cost of such charges. He was not aware of any foundation for the suggestion that any information obtained by the Corporation in the conduct of the agency was being improperly utilised. The new arrangement had met with the approval both of the Colour Users' Association and dye manufacturers other than the British Dyestuffs Corporation. He was not in a position to make any statement as to the profit or loss made by the Central Importing Agency, as the company carrying on the agency was paid on a commission basis, which, however, it was proposed to revise, since it was now shown that the original terms as agreed were inadequate.

Scientific Instruments

Sir A. Marshall was informed by Sir P. Lloyd-Greame (House of Commons, December 4) that the report of the Committee under Part II. of the Safeguarding Act, which investigated the application for a duty on scientific instruments had been received, and was under consideration. It was hoped to make an announcement at an early date.

Incandescent Mantles

Sir P. Lloyd-Greame (House of Commons, December 6) moved the continuance of the Order bringing imported incandescent gas mantles under the anti-dumping provisions of the Safeguarding of Industries Act. The motion was carried by 245 votes to 194.

Heavy Fuel Oils

Some Factors affecting their Utilisation

At a meeting of the North East Coast Institution of Engineers and Shipbuilders, held at Newcastle-on-Tyne on December 1, Mr. Harold Moore, M.Sc., read a paper on the factors affecting the utilisation of heavy fuel oils in internal combustion engines, in the course of which he dealt at some length with the coal tar oils.

Mr. Moore said he had determined the temperatures of the ignition of various fuel oils, and had found comparatively little variation amongst fuels of the same type but great variation between the petroleum oils and the tar oils. The spontaneous ignition temperatures of various fuels determined in an atmosphere of oxygen were as follows:—Petroleum oils—Petrol, 270 and 279° C.; kerosene, 251 to 253° C.; gas oil, 254° C.; residual oils, 259.5 to 269° C.; Coal Tar oils—Commercial benzol, 566° C.; commercial toluol, 516° C.; creosote from gasworks tar, 415 to 473° C.; creosote from low temperature tars, 290 to 350° C.; Shale oils, 251° C.; Animal and Vegetable oils—Whale oil, 273° C.

The raw coal tars, he continued, presented the ignition difficulties usually encountered with coal tar products, but in addition, they contained bituminous bodies and a solid substance known as free carbon. That substance was not actually carbon but was found to contain about 2½ per cent. of hydrogen and 4½ per cent. of oxygen and nitrogen.

Determination of Free Carbon

The free carbon content was analytically determined by dissolving the tar in a mixture of acetic acid and toluene and filtering off the insoluble portion. The analyses of tar varied very greatly, depending mainly upon the carbonising plant from which they originated and, as a general rule, they were much more difficult to burn than petroleum products. The average free carbon content of a few typical tars were:—Vertical retort tar, 5.2 per cent.; inclined retort tar, 17.0 per cent.; horizontal retort tar, 20.8 per cent.; coke oven tar, 10.4 per cent.; low temperature carbonisation tar, 1.0 per cent. The free carbon content varied almost directly with the rate of heating of the retort. The content of free carbon was thus higher in horizontal retort tar than in low temperature carbonisation tars.

Finsbury Technical College Old Students

THE second annual general meeting and smoking concert of the Manchester Section of the Finsbury Technical College Old Students' Association was held on November 24 at the Grand Hotel, Manchester, Mr. A. P. M. Fleming (the chairman) presiding. A very good attendance of Old Finsburians was recorded and an excellent programme contributed to the enjoyment of a thoroughly successful meeting. A walk is being arranged early in the New Year and the annual dinner will take place in February. Any old students of Finsbury, in the Manchester district who are not members of the Association may obtain membership particulars from the local secretary, Mr. H. F. Couchner, 74, Victoria Road, Stretford, or c/o the Metropolitan-Vickers Electrical Co., Trafford Park, Manchester.

From Week to Week

AT CAMBRIDGE on December 2 the degree of D.Sc. was conferred upon Mr. W. T. David, of Trinity College.

THE TITLE of the *Canadian Dyer and Color User* has been changed to *Canadian Colorist and Textile Processor*.

MR. R. G. W. NORRISH, of Emmanuel College, Cambridge, has been awarded the Gordon Wigan prize in chemistry.

SIR ARTHUR KEITH has been elected secretary of the Royal Institution in succession to the late Colonel E. H. Grove-Hills.

SIR GEORGE ROWLAND BLADES, M.P., announces that he is not connected in any way with the Dominion Tar and Chemical Co., Ltd.

DAMAGE amounting to about £2,000 was caused by fire, on December 2, at the naphtha works of J. F. Greenwood and Co., Ltd., Ingrow, Keighley.

BUILT BY Lord Leverhulme in memory of his late wife, the Lady Lever Art Gallery at Port Sunlight will be formally opened by Princess Beatrice on December 16.

THE NIGER CO., LTD., have, it is reported, decided to remove their head offices from Lever House, Blackfriars, London, to Royal Liver Buildings, Liverpool.

A DECISION by the German Imperial Potash Syndicate to increase potash prices by 58 per cent. is reported by the Amsterdam correspondent of the Exchange Telegraph Co.

MR. E. P. W. FOCKE, formerly a chemical merchant in London, is now manager of the import department of the American Export Corporation, of 11, Broadway, New York.

RESEARCHES at Liverpool University have resulted in the production of small quantities of synthetic sugar (glucose) in syrup form by means of the action of light upon carbonic acid.

MR. ROBERT MOND, of Combe Bank, Sundridge, Kent, was on Wednesday married at the Marylebone Registry Office to Mrs. Marie Louise Gugenheim, of Cavendish Mansions, Langham Street, London, W.

"DEATH from natural causes" was the verdict at an inquest on Mr. B. A. Pearson, a labourer, who fell dead at the works of J. W. Leitch and Co., Milnsbridge. Mr. Chambers expressed the firm's regret at the incident.

THE INSTITUTE of PATENTEES have set up a Court of Arbitration, to which disputes between inventors, patentees and manufacturers may be referred. The head office of the Institute is at 44, Great Russell Street, London.

A DEPARTMENTAL COMMITTEE has been appointed to investigate the method of charging for gas on a thermal basis. The Committee consists of Sir C. Hyde (chairman), Mr. A. Balfour, Sir James Martin, Mr. A. A. Pugh, and Mr. W. J. U. Woolcock.

AT A MEETING of the Chemical Society, to be held at the Institution of Mechanical Engineers, Storey's Gate, London, on December 14, at 8 p.m. Professor C. H. Desch will deliver a lecture on "The Metallurgical Applications of Physical Chemistry."

IT IS REPORTED that the zinc oxide works at Burry Port, Carmarthenshire, have been sold, after having been idle for about two years. The purchasers, whose names have not been disclosed, are said to be contemplating the resumption of operations early next year.

LECTURING before the Ethnological Society in London on Monday on "Character and Commerce," Lord Leverhulme said the lines of success were founded upon service to others, without which, in some form or another, there could be no successful commerce.

A PROCESS for the cheap production of hydrogen is said to have been invented by a Munich chemist. It is further stated that the hydrogen will be extracted from water and that a company, in which foreign capital will predominate, is being formed to exploit the invention.

THE BRITISH CYANIDES CO., LTD., in a circular issued to shareholders, state that the view expressed in the last annual report, to the effect that the problem of the fixation of atmospheric nitrogen will have been solved during the current financial year, has been strengthened by recent work.

OWING to the resignation of Professor Smithells, the professorship of chemistry in the University of Leeds will fall vacant at the end of the present session. A new appointment, taking effect on October 1, 1923, of which the salary will be £1,200 a year, will be made in due course. Further in-

formation may be obtained from the Registrar at the University.

IN A LECTURE at the Royal Academy on "The Preservation from Decay of Stone on Buildings," Professor A. P. Laurie described a preparation that he had discovered which deposits hydrated silica as a cement between the particles of the stone. Although it would not solve the problem in regard to limestones, he thought it would be successful in the preservation of sandstones.

AT A MEETING of the Co-Partners' Club of C. Thomas and Brothers, Ltd., soap manufacturers, Bristol, on November 27, Mr. E. Lewis, F.I.C., gave a lecture on "Soap and Glycerin Manufacture," in which he dealt with the early history of soap making, the antiquity of the industry in Bristol, modern methods of seed crushing and soap manufacture, and the recovery of glycerin as a by-product.

AT THE ANNUAL MEETING of the Royal Society the following medals were awarded: The Davy Medal to Professor J. F. Thorpe for his researches in synthetic organic chemistry; the Copley Medal to Sir Ernest Rutherford for his researches in radio-activity and atomic structure; and the Hughes Medal to Dr. T. W. Aston for his discovery of isotopes of a large number of the elements by the method of positive rays.

DEMONSTRATIONS of the measurement of the internal diameters of transparent tubes and a simple differential refractometer for liquids, will be given by Dr. J. S. Anderson at a meeting of the Optical Society, to be held at the Imperial College of Science and Technology, South Kensington, on December 14. A constant bubble, claimed to be unaffected in length by changes of temperature, by R. R. Watts and Sons, Ltd., will also be exhibited.

THE GENERAL BOARD of STUDIES at Cambridge University have recommended that a University Lectureship in Crystallography be established, and that, subject to the approval of the Special Board of Physics and Chemistry, Mr. A. Hutchinson, F.R.S., Fellow of Pembroke College and President of the Mineralogical Society, be appointed Lecturer, with a stipend of £100, provided out of the Fee Fund of the Department of Mineralogy.

SPEAKING on Monday at a meeting of the Institution of Rubber Industry, Mr. G. R. Crowther expressed the opinion that we had not by any means reached finality in the commercial applications of rubber. The research work which was now being carried out was mainly individual, and so far comparatively little effort had been devoted to the promotion of strictly new uses for rubber. The only equitable basis upon which research work in conjunction with new uses could be carried out was a co-operative one.

OWING to his appointment as British Ambassador at Paris, Lord Crewe, who recently accepted the Presidency of the British Science Guild, has had to withdraw from this office, but has become a Vice-President of the Guild and also a member of the Committee being formed to make a special appeal for adequate funds to maintain and extend the activities of the Guild on behalf of British science. Lord Askwith has consented to accept the Presidency of the Guild and the Lord Mayor of London has become a Vice-President.

ACCORDING to the annual report of the Royal Technical College, Glasgow, the research work carried on in the College is extending rapidly both in volume and importance. The appointment of several research assistants has become possible by the institution of the new Development Fund, and a gratifying feature, the report states, is the attraction which the staff and equipment of the College have for well-qualified workers from other institutions who desire to take up research in the fields with which the College is particularly associated. The total of 42 students who were awarded the B.Sc. degree included 14 in applied chemistry.

THE BRITISH SILK RESEARCH ASSOCIATION, which was incorporated in 1920, has decided to place its research laboratory at Leeds University, where, by arrangement, the University Council has erected laboratories adjacent to the Textile Industries Department. These are now occupied by the British Silk Research Association, and scientific work is in progress. The chairman of the British Silk Research Association is Sir Frank Warner. The Director of Research is Dr. W. S. Denham. He and his colleagues have opportunities of co-operation with the Leeds University Departments of Textile Industries, Colour Chemistry and Dyeing, etc.

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French

ELECTRO-CHEMISTRY.—Treatment of aluminium before nickel-plating. E. Tassily. *Bull. Soc. Chim.*, October, 1922, pp. 973-976.

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German

PRODUCER GAS.—The equilibrium of producer gas at high pressures. K. Jellinek and A. Diethelm. *Z. anorg. u. allg. Chem.*, October 27, 1922, pp. 203-229.

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DEHYDROGENATION.—The dehydrogenation of *p*-cresol. R. Pummerer, D. Melamed and H. Puttfarcken. *Ber.*, October 14, 1922, pp. 3116-3132.

HYDROCARBONS.—The synthesis of pyrene. K. Fleischer and K. Schranz. *Ber.*, October 14, 1922, pp. 3280-3290.

Biphenylene-ethylene. H. Wieland, F. Reindel and J. Ferrer. *Ber.*, October 14, 1922, pp. 3313-3317.

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COMBUSTION.—Formation of acetylene and ammonia by incomplete combustion. K. A. Hofmann and E. Will. *Ber.*, October 14, 1922, pp. 3228-3233.

ALDEHYDES.—The *ar*-aldehyde of tetrahydronaphthalene. K. Fleischer and G. Feldmeier. *Ber.*, October 14, 1922, pp. 3290-3293.

Patent Literature

Abstracts of Complete Specifications

188,008. OIL HAVING THE CHEMICAL PROPERTIES OF OIL OF TURPENTINE, PROCESS FOR OBTAINING. C. Lefebvre, 208, Grande Rue, St. Maurice (Seine), France. Application date, March 9, 1921.

Rubber waste is heated in a retort to about 220° C. by means of superheated steam, either directly or indirectly. The vapour is condensed, and then rectified by steam distillation to remove sulphuretted hydrogen and other impurities. The resulting oil varies in density from 0.6 to 0.9, and may be bleached and deodorised.

188,010. CHINA CLAY, MANUFACTURE OF. N. Testrup and Techno Chemical Laboratories, Ltd., 47, Victoria Street, London, S.W.1. Application date, May 30, 1921.

A mixture of china clay and water is allowed to settle in tanks having sides sloping inwards towards the bottom, and each is provided with a conveyor at the bottom. The water content of the clay which settles out decreases towards the bottom of the settling tank, so that the conveyor removes only the clay containing least water. This clay is fed continuously to a drier in which it is spread on the outer surfaces of two rotating drums, which are heated by the compression and utilisation of the evolved vapour as described in Specification No. 149,055 (see THE CHEMICAL AGE, Vol. III, p. 292). The dried powder is removed by scrapers, and contains only a very small proportion of water. To effect a further refining of the clay, the dry powder is delivered with a stream of air into a series of settling chambers in which the heavier particles of mica, quartz, and feldspar are separated. A very fine clay may thus be obtained similar to that obtained by converting the clay into a colloidal suspension, separating the impurities, and precipitating the clay.

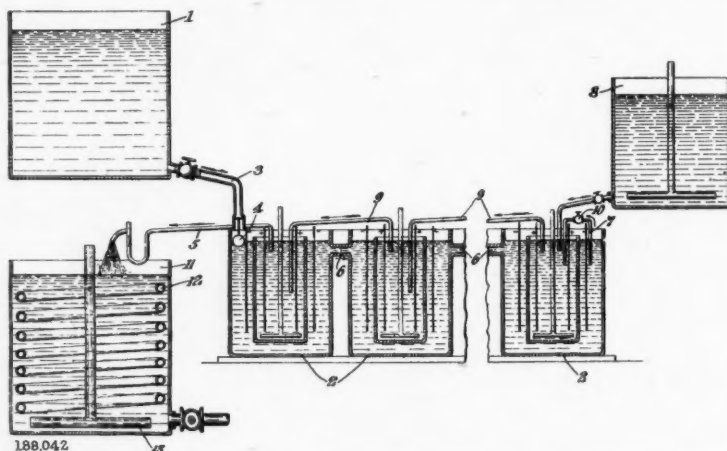
188,019. DISTILLATION OF SOLID CARBONIFEROUS MATTER. C. P. Markham, Broad Oaks, Chesterfield, Derby, and the Staveley Coal and Iron Co., Ltd., Staveley, near Chesterfield, Derby. Application date, June 28, 1921.

The object is to distil coal, carbonaceous material, carboniferous shale and other waste coal-mine material at a low temperature, so as to avoid the production of fixed combustible gases. A high yield of oils and hydrocarbons of the paraffin and olefine series is obtained, also ammonia and a residual coke or semi-coke. The material is distilled in a vertical retort by a gradual combustion from the top, with a carefully regulated supply of steam and air. The temperature is kept as low as possible while maintaining combustion, and the combustion zone, which is about 4-8 inches wide, is caused to move slowly downwards through the retort. The distillation is partly effected by the downward passage of the products of combustion through the charges. The temperature of the outflowing gases at the bottom is about 60° C. during the distillation, and rises rapidly to 200° C. at the end of the distillation, which is thus indicated. The distillation products are compressed and condensed. As an example, 1 ton of bastard cannel containing fixed carbon 64 per cent., volatile hydrocarbons 22.7 per cent., ash 12.4 per cent., and sulphur 0.9 per cent., yielded about 40 gals. of shale oil and some absorbed light oils, 35 lb. ammonium sulphate, and a solid residue of 60 per cent. of the coal, which contained 71.9 per cent. of fixed carbon and is suitable as a fuel. Ordinary coal may be similarly treated by this process.

188,042. ELECTROLYTICALLY OXIDISING OR REDUCING SUBSTANCES, PROCESS AND APPARATUS FOR. C. J. Thatcher, 27, West 95th Street, New York. Application date, July 28, 1921.

The apparatus is particularly suitable for electrolytically oxidising anthracene to anthraquinone by a dilute sulphuric acid solution of sodium bichromate. The vessel 1 contains spent chrome liquor from a preceding oxidation, which con-

sists mainly of sodium and chromium sulphates and sulphuric acid. This liquor passes through a pipe 3 and valve 4 to the cathode compartment of the first of a series of cells 2. The liquor passes in succession through the cathode compartments of the remaining cells, in which most of the sulphuric acid is eliminated and any sodium bichromate from the preceding oxidation is reduced to sodium and chromium sulphates. Sufficient sulphuric acid must be present in the liquor in the tank 1 to ensure that the liquor in the last cell of the series remains acid. The liquor then flows through a syphon 7 and valve 10 to the anode compartment of the last cell, and oxidation of the anolyte commences, with regeneration of sodium bichromate. The tank 8 contains finely divided sublimed anthracene mixed with some of the catholyte from the last cell. This mixture is fed into the anode compartment of the last cell, in which the temperature of the liquor is about 75° C., and oxidation of the anthracene commences under

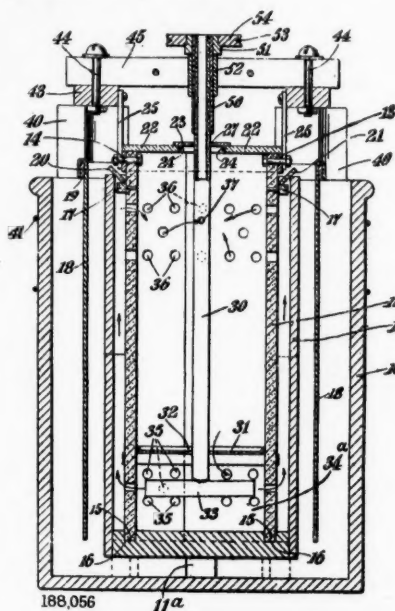


similar conditions to those employed in the chemical process for the oxidation of anthracene. The anthracene and anthraquinone are kept in suspension by agitation of the liquid, and the conditions are regulated so that the rate of oxidation of the anthracene corresponds with that of the generation of sodium bichromate. The mixture flows through the cells in succession at such a rate that complete oxidation of the anthracene is effected by the time the anolyte reaches the first cell of the series at a temperature of about 95° C. The mixture then passes into a vessel 11 having a heating coil 12 and stirrer 13, and thence to a filter for separating the anthraquinone. The filtrate is returned to the tank 1.

188,056. ELECTROLYTIC CELL. C. J. Thatcher, 27, West 95th Street, New York. Application date, July 29th, 1921.

The container 10 of earthenware or the like is provided with an inner porous cell 11 of semi-permeable nature, which may be constructed of "filtros" impregnated with a gelatinous material such as sodium silicate. An inner electrode 12 projects above the cell 11 and the top of this cell may be closed by glass plates 20, 22. A central closing plate 23 of lead is provided with an opening 27 to receive a stirring member 30, which carries a transverse member 33 below a false bottom 31. The rotation of the stirrer causes a circulation of the liquid through openings 35 into the annular space within the walls 11, and then back into the central space through openings 36. Openings 37 are provided in the stirrer member 30, so that the liquid circulates downwards through this member and the cross piece 33, and complete mixing is obtained. The stirrer is rotated by means of a pulley 54, and is mounted on a transverse beam 45 consisting of two parts clamped together and bolted to the remainder of the structure in such a manner that the apparatus may be readily taken apart. The cell is suitable for electrolytic operations in general but particularly for the production of paramidophenol. The outer annular vessel then forms the anode compartment and is filled with

sulphuric acid and contains a lead anode 18. The central compartment contains a cathode of carbon plates, and a mixture of nitrobenzene and sulphuric acid.



188,058. PETROL, PRODUCTION OF. F. Tinker, 4, Gladstone Road, Erdington, Birmingham. Application date, July 29, 1921.

Petrol has been produced from crude mineral oils by distilling and cracking the oil, mixing the superheated vapour from the cracking chamber with crude oil, and treating the mixture in a fractionating column, the residue from the fractionating column being returned to the still. It is now found that in treating crude oils containing asphaltic compounds and sulphur, it is not desirable to return the whole of the residue to the still. The crude oil is mixed with the superheated oil vapour in a special chamber, and the residue collecting in this chamber is removed before the vapour passes to the fractionating column. The still is then supplied with distillates refluxed from the lower part of the fractionating column in order to produce the necessary superheated vapour.

188,127. ACRIDINIUM COMPOUNDS, MANUFACTURE OF NEW SALTS OF. R. B. Ransford, London. From L. Cassella and Co., G.m.b.H., Frankfurt-on-Main, Germany. Application date, September 1, 1921.

The object is to obtain salts of acridinium compounds which are soluble in oils and fats. A mineral acid salt of an acridinium compound is treated with a salt of a fatty acid of high molecular weight, both in aqueous solution. Examples are given of the production of compounds from sodium stearate and 3:6-diamino-10-methyl-acridinium chloride or 2:7-dimethyl-3:6-diamino-10-methyl-acridinium chloride. The products are insoluble in water, but soluble in fatty oils, alcohol, benzene, or chloroform.

188,193. GAS PURIFIERS. R. and J. Dempster, Ltd., and R. W. Broadhead, Gas Plant Works, Oldham Road, Manchester. Application date, October 26, 1921.

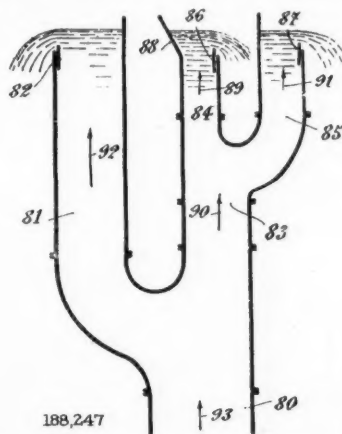
The object is to provide a secure holding-down device for the cover of a gas purifier. A lever is pivoted to a projecting lug on the purifier just below the cover, and projects upwards through a slot in the flange of the cover. To the free upper end of this lever a second lever is pivoted and projects downwards so as to press the cover on to its seating. The device thus comprises a pair of toggle levers, which are axially in line with one another when the cover is on, but which may be released by swinging about the lower fixed pivot, so as to move the two levers out of line and thus "break" the toggle. In an alternative, the shorter lever which secures the cover may be replaced by a cam or eccentric which bears on the cover.

188,208. WASTE LIQUOR FROM DYEING OPERATIONS, OBTAINING VALUABLE PRODUCTS FROM. The Silver Springs Bleaching and Dyeing Co., Ltd., and A. J. Hall, Timbersbrook, Congleton, Cheshire. Application date, November 11, 1921.

The process is for obtaining a prussian blue pigment from waste liquor from prussiate aniline black dyeing, which is obtained in washing the dyed cloth during the after-chroming treatment. This liquor contains prussiates and chromium salts. The liquor is treated with a solution of ferrous sulphate which yields a blue cyanogen compound of low tinctorial power, and this may be treated with an alkali such as sodium or potassium carbonate, caustic soda or potash, ammonia or lime, to convert it into a ferrocyanide and an hydroxide, oxide or carbonate of iron. The mixture is then acidified with an organic or mineral acid yielding another blue cyanogen pigment of greater strength. In a modified process, the mixture, after treatment with alkali, is mixed with a ferrous iron salt and is then acidified. The ferrous salt reacts with the ferrocyanide, producing a white insoluble compound which becomes blue on the addition of acid. A superior pigment is thus obtained. Examples are given.

188,247. WASHING AND SEPARATING APPARATUS. A. Jacquelin, 11, Avenue Pasteur, Paris. Application date, December 20, 1921.

The apparatus is for washing and classifying a complex mixture into three or more constituents of different densities. A conduit 80 is supplied with liquid from a constant level tank, and is divided into two branches 81, 83. The branch 83 is divided into two branches 84, 85, and all the branches are provided with adjustable overflows 82, 86, 87. The mixture to be treated is first screened, and then supplied to the branch 84. The ascending current of liquid in this branch has a speed greater than that of the limiting downward speed of the lightest constituents of the mixture. These light constituents are therefore discharged with the liquid at the overflow 86. The heavier products descend to the zone 83, and the lightest constituents in this mixture are carried into the branch 85 and discharged at the overflow 87. Those constituents having limiting speeds greater than that of the current go descend to the conduit 80, and are carried into the branch 81, and thence to the overflow 82. The heaviest constituents of the mixture are not carried away by the liquid, but are withdrawn at the bottom of the apparatus. The necessary speeds of the washing liquid in the conduits 80, 81, 83, 84, 85, are obtained by a suitable regulation of the over-



flows 82, 86, 87. The apparatus may be provided with additional branches to separate a larger number of constituents from the mixture. Other arrangements are also described, including one in which the liquid overflows over the whole of the periphery of the outlet branch conduits.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention:—168,867 (P. Kestner) relating to washing and displacement of gases, see Vol. V, p. 603; 169,962 and 170,562 (M. Melamid) relating to the manufacture of substances of

the fatty acid type, see Vol. V., pp. 709 and 774; 173,479 (J. Schatzkes) relating to a process of purifying lactic acid, see Vol. VI., p. 287; 175,238 (Badische Anilin und Soda Fabrik) relating to the manufacture of alcohols, see Vol. VI., p. 494.

International Specifications not yet Accepted

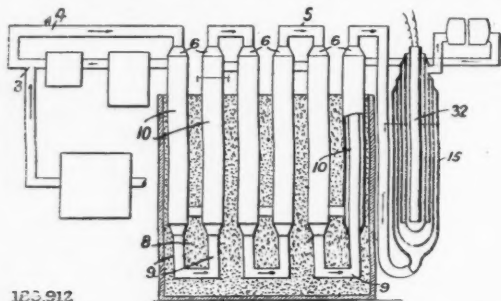
186,899-186,900. METHANE. Farbwerke vorm. Meister Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, October 4, 1921.

186,899.—A mixture of steam and carbon monoxide or water gas is passed over a nickel contact mass. The product is freed from steam and then passed over a second nickel contact mass maintained at 350°-400° C. Carbon dioxide is removed from the resulting product, leaving pure methane or a mixture of methane and hydrogen. The second nickel contact mass may be obtained from calcined nickel nitrate, or it may be obtained from organic nickel compounds, in which case a temperature of 300° C. may be employed for the gaseous reaction.

186,900.—This is an addition to Patent No. 146,110 (see THE CHEMICAL AGE, Vol. III, p. 320), which describes the production of methane from carbon monoxide and hydrogen. In this invention, carbon dioxide is also added to the mixture, and the carbon monoxide and hydrogen are used in the proportions of 1:3. A nickel contact mass, obtained by the reduction of precipitated nickel carbonate is used, and a mixture of carbon monoxide and dioxide, hydrogen and nitrogen is passed over it. Water is removed, and the process is repeated. Water and carbon dioxide are then removed, and a mixture of methane and nitrogen is obtained. The process may also be applied to the treatment of illuminating gas which has been freed from sulphur and cyclic hydrocarbons, and mixed with carbon dioxide.

186,912. AMMONIA SYNTHESIS. Nitrogen Corporation, 55, Canal Street, Providence, R.I., U.S.A. Assignees of E. H. Arnold, Coventry, R.I., U.S.A., and W. T. Wakeford, Providence, R.I., U.S.A. International Convention date, October 5, 1921.

The reaction gases are forced at a pressure of 100 atmospheres from a pump through a pipe 4 to the inner tubes 9 of a heat exchanger 5. This device consists of inner and outer



tubes 9, 10, surrounded by insulating material 8, and the outgoing gases pass through the outer tubes 10. The gaseous mixture then passes through a preheater 15, consisting of a nest of concentric tubes and a central electric heater 32. The mixture then passes through the reaction apparatus and then through the tubes 10 to a liquifier for removing the ammonia. The residual gas is returned to the system.

LATEST NOTIFICATIONS

- 189,416. Cellulose solutions. Nitrogen Corporation. November 21, 1921.
 189,419. Manufacture of artificial manures. Gradl, J. November 22, 1921.
 189,432. Manufacture of formaldehyde. Farbwerke vorm. Meister, Lucius, and Brüning. November 25, 1921.
 189,444. Treatment of photographic films and apparatus therefor. Counsell Film Process and Chemical Co., Ltd. November 22, 1921.
 189,450. Process for the production of inactive menthol. Rheinische Kampfer Fabrik Ges. November 23, 1921.
 189,453. Process for the production of liquid-fuel mixtures with alcohol as basis. Lonette, P. November 21, 1921.
 189,458. Distillation and rectification with double-effect of the steam and apparatus therefor. Barbet et Fils et Cie., E. November 21, 1921.

Specifications Accepted, with Date of Application

- 163,047. Mixtures of nitrogen and hydrogen suitable for the production of ammonia, Process of preparing. Nitrogen Corporation. May 8, 1920.
 163,703. Hydrogen or mixtures of nitrogen and hydrogen, Production of. Nitrogen Corporation. May 25, 1920.
 167,156. Concentrated hydrogen peroxide solution, Manufacture of. W. Mau. July 26, 1920.
 171,972. Ammonia, Synthesis of. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. November 20, 1920.
 172,944. Iron in mineral acid alumina solutions, Precipitation of. Aktieselskabet Labrador. December 16, 1920.
 188,686. Hydrocarbons from shale, wood or the like, Extraction of. Plauson's (Parent Co.), Ltd. (H. Plauson). May 17, 1921.
 188,693. Furnaces for the utilisation of bituminous shale and the like by distillation and subsequent combustion. S. V. Bergh and K. E. Larsson. May 20, 1921.
 188,703. Heating or cooling of liquids or admixed solids and liquids in evaporative or like treatment, Method and apparatus for. T. Rigby. June 16, 1921.
 188,723. Charcoal or other absorbent substances, Recovery of gases or vapours from. E. R. Sutcliffe and H. S. Raper. July 16, 1921.
 188,772. Salts of oxidised protalbinic and lysalbinic acids. M. E. Wolvekamp. August 16, 1921.
 188,786. Absorbents and adsorbents of condensable gases and vapours, Manufacture of materials for. B. Lambert. August 18, 1921.
 188,807. Carbon, Production of. A. M. Hart. August 24, 1921.
 188,814. Magnetic separators. J. S. Atkinson and Powdered Fuel Plant Co., Ltd. August 25, 1921.
 188,854. Colloidal sulphur, Manufacture of. Plauson's (Parent Co.), Ltd. (H. Plauson). September 23, 1921.
 188,865. Metals from ores, Method of extracting—with nitric acid. J. S. Wetzlar. (H. Pauling). September 29, 1921.
 188,868. Metals and alloys insoluble or only gradually soluble in sulphuric acid, Method of transforming into sulphates by the action of nitric acid. J. S. Wetzlar. (H. Pauling). September 30, 1921.
 188,928. Light hydrocarbon distillates from heavier hydrocarbons, Method of obtaining. D. W. Hovey. October 31, 1921.
 188,933. Phenyl glycine compounds, Manufacture of. British Dyestuffs Corporation, Ltd., and M. Wyler. November 3, 1921.
 189,013. Refining lead. H. Harris. January 18, 1922.
 189,074. Metaldehyde, Manufacture or production of—and obtaining fuel bodies therefrom. Elektrizitätswerk Lonza. March 9, 1922.
 184,795. Sulphides and hydrosulphides of the alkali metals, Method of producing. J. Ephraim. August 20, 1921.

Applications for Patents

- Badische Anilin und Soda-Fabrik and Johnson, J. Y. Manufacture of vat colouring-matters. 32423. November 27.
 Burn, J. F., Lancaster, J. S., and Langford, H. Machine for mixing or washing viscous, plastic, etc. substances. 32753. November 30.
 Carroll, J. C. Extraction of titanium from ilmenite, etc. 32954. December 2.
 Dynamit-Akt.-Ges. vorm. A. Nobel and Co. and Naoum, P. Manufacture of gelatinous nitro-glycerine explosives proof against fire-damp. 32409. November 27. (Germany, December 1, 1921.)
 Freund, J. F. Taking Röntgen pictures for medical, etc., purposes. 32850. December 1.
 Gas Light and Coke Co. and Lewcock, W. Manufacture of p-nitrophenetole from p-nitrochlorobenzene. 32969. December 2.
 Gregory, S. Oil-fuel burner. 32408. November 28.
 Hirschberg, L. M. Compositions containing formaldehyde. 32520. November 28.
 Hoveman, F. C. and W. A. Filtration, purification and softening of water. 32542. November 28.
 Hutchins, T. W. S. Retorts for distillation of carbonaceous materials, etc. 32525. November 28.
 International Takamine Ferment Co. Yeast stimulant, and process of manufacturing same. 32361. November 27. (United States, July 25.)
 Koppers Co. Purification of gases. 32387. November 27. (United States, December 8, 1921.)
 Layraud, E. Manufacture of asymmetrical dialkylbarbituric acids and products therefrom. 32647. November 29. (France, December 31, 1921.)
 Lefebvre, V. Vulcanisation of rubber, etc. 32641. November 29.
 Melhuish, W. J. Artificial milk from legumes other than soya. 32605. November 29.
 Moore, Q. Recovery of ammonia. 32887. December 1.
 Plauson's (Parent Co.), Ltd., and Plauson, H. Hydrogenation and/or cracking of organic compounds. 32488. November 28.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, DECEMBER 7, 1922.

THE volume of trade is still rather smaller than during November, but there has perhaps been an improvement over last week.

The slackening down in demand is, of course, quite sensible, having regard to the approach of the stock-taking period.

The demand from the industrial North has been particularly slow, but, nevertheless, prices tend upwards and an improvement is expected.

Export business remains better.

General Chemicals

ACETONE is an active market; price is well maintained.

ARSENIC still shows an advancing tendency. Makers are well sold for the next six months.

ACID ACETIC is in good demand, and price is firmer.

ACID CITRIC.—Unchanged.

ACID FORMIC.—The turnover has improved, and price is firm.

ACID LACTIC is rather slow but price tends upwards.

ACID OXALIC is in fairly good demand and stocks are short.

Price for early delivery is again firmer.

ACID TARTARIC is distinctly firmer in price, owing to the improvement in certain Continental exchanges.

BARIUM CHLORIDE is a rather slow market. Price unchanged.

CREAM OF TARTAR is rather firmer, and buyers are appearing in the market.

FORMALDEHYDE is again higher in price, and supplies are scarce.

LEAD ACETATE is in fairly good demand, and price tends upwards.

LEAD NITRATE.—Unchanged.

METHYL ALCOHOL is practically unobtainable for spot delivery, and the forward position is firm and tight.

POTASSIUM CARBONATE is a lifeless market.

POTASSIUM CAUSTIC remains weak, with almost entire absence of improvement.

POTASSIUM PERMANGANATE is fairly active. Orders are on the small side.

POTASSIUM PRUSSIAN.—Price is much firmer, and makers are well sold ahead.

SODIUM ACETATE remains very firm, with some production sold for the first half of next year.

SODIUM BICHROMATE is unchanged.

SODIUM HYPOSULPHITE.—There has been some demand at recent values.

SODIUM NITRITE is without special feature; price firm but unchanged.

SODIUM PRUSSIAN is in steady demand, both for prompt and forward delivery.

ZINC OXIDE is again higher in price.

Pharmaceutical Chemicals

ACID ACETYL SALICYLIC continues in demand, with price tending upwards.

ACID LACTIC B.P. 1'21 has advanced in price; spot supplies being scarce owing to improved demand.

ACID SALICYLIC B.P. is firm, in sympathy with carbolic acid.

We are of the opinion that present prices are unremunerative to manufacturers, and may be expected to advance when the cheaper parcels, based upon old purchases of raw materials, have passed into consumption.

BROMIDES look cheap at present quotations. Owing to the higher prices now asked by Continental manufacturers an improved market should result when second-hand stocks now in the hands of weak holders have been cleared.

CALCIUM LACTATE.—A steady business is passing, with limited stock being rapidly absorbed.

EUCALYPTUS OIL is in seasonable demand. Supplies are none too plentiful, and we would not be surprised to see a further advance shortly.

HEXAMINE is dearer, with a tendency towards a still higher price.

MILK SUGAR is steady on an active market.

PHENACETIN remains slow of sale; the price, however, being well maintained.

PHENOLPHTHALEIN, after the recent rapid advance, continues in good demand at the higher figure, which is readily paid.

TERPENE HYDRATE remains slow of sale, at prices which have reached a low level.

VANILLIN.—Orders are keenly competed for on a falling market in sympathy with the price quoted for cloves to arrive.

Coal Tar Intermediates

There is little change to report in this section from last week, but there has been slightly more export inquiry.

ALPHA NAPHTHOL is firm, and small stocks are available for immediate delivery.

ALPHA NAPHTHYLAMINE has been inquired for on export account, while home trade is quiet.

ANILINE OIL is steady.

ANILINE SALT.—Some export inquiry.

BENZIDINE BASE is without special feature.

BETA NAPHTHOL.—Some home orders have been booked.

BETA NAPHTHYLAMINE is a firm home business.

DIPHENYLAMINE is firm, with small available stocks.

"G" SALT has been of considerable interest for export.

"H" ACID is quiet.

METATOLUYLENEDIAMINE.—Some small home business has been placed.

PARAPHENYLENEDIAMINE is steady, with some home inquiry about.

Coal Tar Products

The market is, in general, fairly active, and prices are maintained.

90's BENZOL is in moderate request at about 1s. 8d. to 1s. 9d. per gallon on rails in the North and 1s. 11d. to 2s. per gallon on rails in London.

PURE BENZOL is quiet, with sellers at 2s. per gallon in the North, and 2s. 3d. to 2s. 4d. in the South.

CREOSOTE OIL is still in good request, and is now worth 6½d. to 6¾d. per gallon on rails in the North and 7¼d. to 7¾d. per gallon in the South.

CRESYLIC ACID is still neglected, and prices are unchanged.

SOLVENT NAPHTHA is steady, at 1s. 8d. to 1s. 9d. per gallon in the North and 1s. 10d. to 2s. per gallon in the South.

HEAVY NAPHTHA is very quiet at about 1s. 6d. per gallon on rails in the North.

NAPHTHALENE.—There is still a fair demand, and prices are unchanged at £7 to £8 per ton on rails for drained and whizzed and £8 10s. for hot pressed.

PITCH.—The market is still quiet and somewhat inactive. Business has been done at 112s. 6d. per ton f.o.b. East Coast, but, for the most part, sellers are asking 120s. both for the East Coast and London.

Sulphate of Ammonia

The position is unchanged.

Current Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride.....	lb.	0	1	6	to	0	1	8
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure.....	ton	130	0	0	to	135	0	0
Acid, Acetic, glacial, 99-100%.....	ton	67	0	0	to	68	0	0
Acetic, 80% pure.....	ton	43	0	0	to	44	0	0

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

GLASGOW, December 6, 1922.

BUSINESS during the past week has been quiet, and the only change of note is a slight reduction in makers' price for soda crystals.

Industrial Chemicals

ACID ACETIC.—A few inquiries for export. Glacial, 98/100% offered at £55 to £57 per ton, early delivery; 80% pure, £42 to £44 per ton; 80% tech., £39 to £41 per ton.
 ACID BORACIC.—Crystal or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K. stations.
 ACID CARBOLIC (ICE CRYSTALS).—Price now about 8½d. per lb. Spot material scarce.
 ACID FORMIC, 80%.—Quoted £56 per ton.
 ACID HYDROCHLORIC.—Makers' price unchanged, 6s. 6d. per carboy, ex works.
 ACID NITRIC, 84%.—Offered at £27 10s. per ton, ex station, carboys extra.
 ACID OXALIC.—Price unchanged at about 7½d. per lb.
 ACID SULPHURIC.—144°, £4 per ton; 168°, £7 5s. per ton, ex works; de-arsenicated, £1 per ton extra.
 ACID TARTARIC.—Moderate inquiry; quoted 1s. 2d. per lb.
 ALUM, LUMP POTASH.—Offered at £13 per ton, spot delivery.
 ALUMINA SULPHATE.—Continental offers of £7 15s. per ton for 14/15%; £8 15s. per ton for 17/18%; c.i.f., U.K.
 AMMONIA ANHYDROUS.—In little demand; 1s. 7d. to 1s. 8d. per lb. ex works.
 AMMONIA CARBONATE.—Lump, 4d. per lb.; ground, 4½d. per lb. delivered.
 AMMONIA LIQUID.—880°, about 3½d. per lb.; 940°, 1¾d. per lb. ex works.
 AMMONIA MURIATE.—Grey galvanisers quality, £32 per ton, f.o.r. works.
 AMMONIA SULPHATE.—25¼% £15 per ton; 25¾% £16 3s. per ton, ex works, November/December.
 ARSENIC WHITE POWDER.—Spot lots scarce. Price £60 to £63 per ton, ex quay.
 BARIUM CARBONATE, 98/100%.—Continental material about £14 per ton, c.i.f. U.K.
 BARIUM CHLORIDE.—98/100%, English material about £20 per ton. Continental offered at £18 per ton, c.i.f. U.K.
 BARYTES.—Finest white English, £5 5s. per ton, ex works.
 BLEACHING POWDER.—Spot lots £12 15s. per ton, ex station. Makers advise reduction of 25s. in next year's price.
 BORAX.—Crystal or granulated, £28 per ton; powdered, £29 per ton, carriage paid U.K. stations.
 CALCIUM CHLORIDE.—English material, £6 per ton, ex quay or station; Continental offered at £3 15s. per ton, c.i.f. U.K.
 COPPER SULPHATE.—Moderate inquiry. Quoted £26 per ton, ex quay.
 COPPERAS, GREEN.—Price £3 15s. to £3 17s. 6d. per ton, ex works.
 DEXTRENE.—Dutch Potato, £19 10s. per ton, c.i.f. U.K.
 FORMALDEHYDE, 40%.—Offers of £80 per ton, ex wharf early delivery.
 GLAUBER SALTS.—Fine commercial crystals, £4 5s. per ton, ex store.
 GLYCERINE.—1260 B.P. quality, £82 10s. per ton, ex store.
 LEAD ACETATE.—Continental make white crystals, £36 10s. per ton, c.i.f. U.K. Red, £38 15s. per ton. White, £50 15s. per ton. Carriage paid U.K. stations in 5-ton lots. Continental Red Lead, £35 per ton, ex store.
 MAGNESITE, GROUND CALCINED.—£7 to £10 per ton, ex store, spot delivery.
 MAGNESIUM CHLORIDE.—Spot lots offered at £4 per ton, ex store.
 MAGNESIUM SULPHATE (Epsom Salts).—Commercial, £7 5s. per ton; B.P., £9 per ton.
 NAPHTHALENE.—Flakes offered at £12 per ton, ex store.
 POTASSIUM BICHROMATE.—Makers' price 6d. per lb. delivered.

POTASSIUM CARBONATE, 88/92%.—Spot lots, £27 10s. per ton, ex store.
 POTASSIUM CAUSTIC, 88/92%.—Price about £29 10s. per ton, ex store, spot.
 POTASSIUM CHLORATE.—Crystal or powdered now about 3½d. per lb.
 POTASSIUM NITRATE (SALTPETRE).—In little demand. Quoted £26 per ton, c.i.f. U.K.
 POTASSIUM PERMANGANATE.—Pure crystals offered at 8½d. per lb.
 POTASSIUM PRUSSIAN, YELLOW.—Quoted 1s. 6d. per lb., ex station.
 POTASSIUM SULPHATE, 90%.—Unchanged at about £13 10s. per ton, ex wharf.
 SODIUM BICARBONATE.—Refined quality, £10 10s. per ton, ex quay or station; mineral water quality, £1 less.
 SODIUM BICHROMATE.—Makers' price, 4½d. per lb., delivered.
 SODIUM CARBONATE.—Price of soda crystals reduced by 5s. per ton; now £5 5s. to £5 10s. per ton, ex quay or station. Alkali, 58%, unchanged, £9 2s. 6d. per ton, ex quay or station.
 SODIUM CAUSTIC.—76/77%, £23 5s. per ton; 70/72%, £21 5s. per ton; 60/62%, £20 5s. per ton; 98/99%, powdered, £26 15s. to £27 15s. per ton, ex station; caustic bottoms, £11 per ton, ex store. Makers advise a reduction of 25s. per ton in prices for solid for next year's delivery.
 SODIUM HYPOSULPHITE.—Commercial quality, £11 per ton, ex store; pea crystals, £17 per ton.
 SODIUM NITRATE, 96/98%.—Quoted £12 10s. per ton, free on rails.
 SODIUM NITRITE.—Export inquiry. Price, £27 per ton, on basis 100%, f.o.b. U.K. port.
 SODIUM PRUSSIAN, YELLOW.—Spot material quoted 11d. per lb., ex station.
 SODIUM SILICATE, 140°.—Price £12 5s. per ton, ex station.
 SODIUM SULPHATE (SALTCAKE 95%).—Price for home consumption, £4 per ton. Higher prices asked for export.
 SODIUM SULPHIDE.—60/62%, Conc. Continental material, £14 5s. per ton, c.i.f. U.K.; 30/32%, crystals about £8 5s. per ton, c.i.f. U.K.
 SODIUM SULPHITE.—White crystals, 23/24% SO₂, at about £20 per ton, c.i.f. U.K.
 SULPHUR.—Government surplus stocks of Sicilian thirds available at £3 10s. to £3 15s. per ton, ex depot; flowers, £11 per ton; roll, £10 per ton; rock, £9 per ton; ground, £9 per ton. Prices nominal.
 TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.
 ZINC CHLORIDE, 98/100%.—White powder offered at £20 per ton, c.i.f. U.K.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZIDINE BASE.—Export inquiries. Price quoted 6s. 6d. per lb., 100% basis, f.o.b.
 BETA NAPHTHOL.—Good demand for export. Price quoted, 1s. 2d. per lb., f.o.b. U.K. port.
 DIMETHYL SULPHATE.—Supplies are offered at 3s. per lb., delivered.
 "G" ACID.—Export inquiry. Price quoted, 3s. 3d. per lb., 100% basis, f.o.b. U.K. port.
 META XYLIDINE.—Export inquiry. Price quoted, 7s. 7d. per lb., f.o.b., drums included.
 NEVILLE WINTHER ACID.—Export inquiry. Price quoted, 6s. per lb., 100% basis, f.o.b.
 PARADICHLOROBENZOL.—Small home inquiry. Price quoted, 6d. per lb., delivered.
 SULPHURIC ACID.—Export inquiry. Price quoted, 1s. 6d. per lb., 100% basis, f.o.b.
 TOLUIDINE.—Export inquiries. Price 1s. 5½d. per lb., f.o.b., drums included.

The Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, December 7, 1922.

THE condition of the chemical market here, although business is being done only on a comparatively small scale, is healthy. Home consumers are buying steadily in small quantities, and for export there is a fair amount of business being put through, mainly for shipment to the Colonies. Inquiries from foreign users generally for delivery over next year are said to be numerous. Meanwhile prices, on the whole, are steady, with here and there a distinct advance.

At this time of the year it is customary to indulge in pious hopes for the future, but, judging from the signs in some of the large chemical-consuming industries, there appears to be sound reason for hoping for a substantial improvement in chemical trade conditions within the next few weeks.

Heavy Chemicals

There is still a fairly satisfactory home and export demand for caustic soda at £21 per ton for 70 per cent. strength, and £23 for 76 per cent. Bleaching powder makers have now announced their 1923 prices: £10 10s. per ton is quoted for contract deliveries over the whole of the year, and £11 10s. for contracts for shorter periods. Meanwhile there is a moderate inquiry for the product. Soda crystals are rather quieter, though £5 12s. per ton, delivered, is still quoted. Saltcake, also, is inactive at £4 10s. per ton, supplies of this product being scarce. Sodium sulphide is unchanged both in position and value at £17 10s. for 60-65 per cent. concentrated, and £11 per ton for crystals. Glauber salts are steady and in moderate demand at £4 10s. per ton. Ammonia alkali is quoted at £7 17s. 6d. per ton for 58 per cent. material, buyers taking fair quantities. Bicarbonate of soda is steady at £10 10s. per ton, in 2 cwt. bags, carriage paid. Hypo-sulphite of soda is quiet and easier, photographic crystals being offered at about £17 10s., and commercial at £10 5s. per ton. Nitrite of soda is in fair demand at £28 per ton. Phosphate of soda has improved a little, and is now quoted at £16 per ton. Prussiate of soda is quiet at 10½d. per lb. Chlorate of soda is in steady demand at 3d. per lb. Bichromate of soda is unchanged at 4½d. per lb. delivered. Acetate of soda is on offer at about £23 10s. per ton, and meets with a quietly steady inquiry.

Caustic potash is firm at £29 per ton for 88-90 per cent. strength, with a moderate amount of business being put through. Bichromate of potash is in good demand at 6d. per lb. There is still a scarcity of prussiate of potash for early delivery, and prices are firm at 1s. 6d. per lb. for yellow, and 4s. to 4s. 3d. for red. Carbonate of potash meets with an active inquiry at £29 per ton for 96-98 per cent. material. Chlorate of potash is firm at 3½d. per lb., a fair demand being experienced. Permanganate of potash is quiet at 7d. to 7½d. per lb.

Sulphate of copper has a somewhat healthier tone at £26 to £27 per ton, f.o.b. Arsenic has again made a big advance, and round about £70 per ton is mentioned for available lots of white powdered, Cornish makes; supplies, however, are exceedingly scarce, and the demand good. Commercial Epsom salts are quoted at £6 per ton. Acetate of lime is weaker, grey being quoted at £14 10s., and brown £8 5s. per ton. Nitrate of lead is still rather quiet at £42 to £43 per ton. White sugar of lead is inactive at £37 10s., with brown at £34 per ton. Ammonium muriate is on offer at £32 for grey and £38 per ton for white. There is nothing fresh to report regarding alum, which is still quoted at £13 10s. per ton for loose lump, delivered.

Acids and Tar Products

Tartaric and citric acids are both very quiet and have an easier tendency; tartaric is now quoted at 1s. 1½d. to 1s. 2d., and citric at 1s. 9d. per lb. for B.P. crystals. Acetic acid is firm and in improved demand at £66 for glacial and £40 per ton for 80 per cent. technical. Oxalic acid is weak at 7d. per lb.

Pitch is scarce, but there is a good deal of uncertainty about the market, and £5 10s. to £6 per ton has been mentioned as the f.o.b. price here. Carboic acid crystals continue to improve, and 8½d. per lb. is now quoted. Crude carboic acid is also strong at 2s. 3d. to 2s. 6d. per gallon for 60 per cent. material. Benzole is quiet but steady at 1s. 8d. per

gallon. Solvent naphtha is unchanged at 1s. 10d. per gallon for 90-160, but there is no improvement in demand. Creosote oil is firm and in good inquiry for export at 7½d. to 7½d. per gallon. Naphthalene has a better feeling all round, though prices are unchanged at up to £7 per ton for crude, £17 for flake, and £15 per ton for crystals.

The Bleaching of Cotton

Employment of Sodium Hypochlorite Solutions

At a meeting of the Midlands Section of the Society of Dyers and Colourists, held at University College, Nottingham, on November 30, Mr. W. M. Inman, M.Sc., read a paper on "The Bleaching of Cotton by means of Sodium Hypochlorite."

After giving a short history of the process of bleaching by the use of chlorine and hypochlorites the lecturer alluded to the factors, number of immersions in the bleaching bath, time of immersion, percentage of available chlorine and temperature of the bath. By varying these independently the effect of each could be found. Concentrations much above 0.5 per cent. in available chlorine and temperatures in the neighbourhood of 37° produced a considerable decrease in the tensile strength of raw cotton.

The relative advantages of sodium hypochlorite and calcium hypochlorite solutions were then discussed. The chemist would consider that the bleaching power only depended upon the percentage of available chlorine and not upon the nature of the alkali. But in practice there were important differences. Bleaching powder deposited calcium carbonate in the fibre, which might impart a harsh feeling. The fabric had subsequently to be soured, an operation which was unnecessary if sodium hypochlorite was used. All sodium compounds, including those which could be formed with the natural colouring matters, were soluble and could be washed out by water alone. The alkalinity of sodium hypochlorite solution was more easily controlled. Too low an alkalinity, such as that found in old bleaching solutions led to rapid bleaching, but might also cause local overbleaching and damage.

Sodium hypochlorite could be prepared by several methods. The author considered it best to use solid caustic soda and liquid chlorine, both concentrated reagents requiring small storage space. The alkali solution must be dilute, and the chlorination could be performed in a bleaching powder vat if gear was available for very rapid stirring. The temperature could thus be easily kept within safe limits (below 25°), and the efficiency of absorption of the chlorine was nearly 100 per cent.

Manchester Chemists' Exhibition

AN interesting exhibit at the Chemists' Exhibition which was held in Manchester recently was that of the Roberts' Patent Filling Machine Co., of 33, Deane Road, Bolton. Their exhibit included machines capable of filling every shape and size of glass bottle, and corking machines which leave the cork well out of the bottle neck. Machines were shown which could be adjusted to fill any weight from 1 drachm to 1 lb. into glass bottles by a regulated flow and an electrical timing movement. Various forms of automatic machines for filling paint, varnish, oil, treacle, rubber solution, metal polishes, &c., were included, as were also machines for filling cans and drums up to 12 gallons, and others for filling flat tins with ointments, petroleum jelly, etc. Fitted with a large aluminium tank, an installation for filling adhesive pastes attracted some attention. The exhibit also included tin lidding machines, emulsifying machines, aluminium tanks, basins, funnels, and vessels for various purposes.

In our list of chemical exhibitors at the forthcoming British Industries Fair (see THE CHEMICAL AGE, Vol. VII, p. 744) the Roberts' Patent Filling Machine Co. was, owing to a typographical error, referred to as the Roberts' Patent Filter Machine Co.

Explosion in Birmingham Laboratory

MR. JOHN NICHOLSON, a laboratory assistant employed by Southall Brothers and Barclay, manufacturing chemists, Birmingham, was severely burned as the result of the explosion of a compound containing chlorate of potash, which he was mixing in a circular pan. The force of the explosion shattered the pan, which was an inch thick, into small fragments.

Company News

BRITISH OXYGEN CO., LTD.—Payable on December 15, an interim dividend of $3\frac{1}{2}$ per cent., free of tax, has been declared on the ordinary shares.

POWER-GAS CORPORATION.—For the year ended September 30 last a dividend at the rate of 5 per cent, less tax (as against 6 per cent.), will be paid.

BLEACHERS' ASSOCIATION—Announcement is made of the declaration of an interim dividend on the ordinary shares of 5 per cent. actual, less tax. This compares with $2\frac{1}{2}$ per cent. paid a year ago.

NEW PEGAMOID, LTD.—For the year to August 31 last, the net profits, after providing for taxation, amounted to £3,257, which, with £5,000 transferred from contingency account, reduces the debit balance of the previous year by £8,257 to £39,817. The annual meeting will be held at 134, Queen Victoria Street, London, on December 13, at 2.30 p.m.

BRITISH CYANIDES CO.—In a circular issued to shareholders the directors state that a small profit has been made during the half year, out of which the preference dividend is being paid, and forward contracts have been entered into which will provide increased profits during the current six months. The merchant business is developing well, and in the opinion of the directors the company has now definitely turned the corner and its prospects are greatly improved.

CASSEL CYANIDE CO.—Including the balance brought in, the accounts for the year to September 30 last show a net profit of £65,109. An interim dividend of 3d. per share was paid in June last, and the directors now recommend a final dividend of 6d. per share, less tax, payable on December 14, to the holders on the books at November 20; £12,234 remains to be carried forward. The annual meeting will be held at the Merchants' House, 7, West George Street, Glasgow, on December 13, at noon.

ANGLO-PERSIAN OIL CO.—Profits amounting to £3,130,381 (against £4,028,022) were secured for the year ended March 31 last, while £1,648,792 was brought forward. A sum of £100,000 (against £80,000) has been placed to debenture redemption reserve; £100,000 (against £50,000) to preference share reserve; £300,000 (against £455,000) to general reserve; £100,000 (the same) to amortisation reserve; and £400,000 (against nil) to extra depreciation. This leaves a balance of £3,779,173. The dividend on the ordinary shares is 20 per cent., less tax (the same), and the sum carried forward is £1,739,173, subject to E.P.D., if any, for the year under review, and corporation profits tax for the last two years.

MAGADI SODA CO.—Including £54,571 for depreciation, the accounts for the year to December 31 last show a debit balance of £167,059. The results obtained from working in 1921 show no improvement over those of the previous year, owing to the fact that the marketing of the company's soda ash in the year under review did not assume a sufficient volume to compensate for expenses. According to advices received from Kenya, the dredger which was specially designed for the company for the excavation of raw soda from Lake Magadi is now operating successfully. The board feel confident that this mechanical means of winning raw soda will result in a substantial increase in output and a decided economy in the cost of production of soda ash, as compared with excavation by native labour. The annual meeting will be held at Winchester House, London, E.C., on December 11, at 2.30 p.m.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. No.
Austria	Manganese.	628
Egypt	Soaps, perfumery, etc.	638
United States of America	Artists' colours, pigments, etc.	639

Nitrate Market Position

Increased American Demand Anticipated

In their monthly report on nitrate of soda, dated November 30, Henry Bath and Son, Ltd., state that during November deliveries of nitrate from European ports amounted to about 45,000 tons, compared with 30,000 tons a year ago.

Foreign exchanges continued throughout the month to exercise an adverse influence upon dealings in Continental markets, though the tendency in those markets is somewhat better to-day than was the case at the beginning of the month. Prices have fluctuated considerably, and at times, the firm state, nitrate is being sold in currency at much below the parity of the cost of importation. Spot nitrate is quoted first-hand to-day at the equivalent of about £12, and spring delivery at that of about £12 10s. per ton delivered.

Nitrate afloat by liner was at one time somewhat pressed on the market, and £11 10s. c.i.f. was accepted for shipments made during September and October for the Antwerp-Hamburg range. Subsequently, on an improvement in the demand, October and November shipment by liners realised from £11 12s. 6d. to £11 17s. 6d.; and the latter figure is the nearest value at the close, December shipment being held for £12 to £12 5s., and January shipment for £12 5s. to £12 10s. c.i.f.

Association's Sales Satisfactory

In spite of prognostications to the contrary, sales by the Nitrate Producers' Association during November have been satisfactory at about 140,000 tons, and bring the total sales by the Association for delivery in Chile during the current nitrate year to about 1,085,000 tons.

A feature has been the continued buying by American shippers, and, while it is difficult to apportion the total sales with any degree of accuracy, it is estimated that rather more than half the total quantity sold to date by the Association is destined for the United States and other countries, and the balance for Europe. The quantity of nitrate already arranged for America indicates a likelihood of that country's consumption being considerably larger than was at one time anticipated. The prospects of consumption in Europe depend to no small extent upon the course of Continental exchanges and also upon Germany's ability to finance importations on any scale of importance, and in this latter connection it is feared that very little progress has so far been made.

The question of extending the duration of the Nitrate Producers' Association until the end of June, 1924, is receiving attention, and it is expected that this prolongation will be agreed to. The present term of the Association ends in January, 1924, and it is obviously better that the moment of transition to whatever may follow should come at the end rather than the beginning of the season of consumption.

Effects of Chlorinating Wool and Cotton

At a meeting of the Nottingham Section of the Society of Chemical Industry, held on November 22, Mr. S. R. Trotman, F.I.C., described some experiments on the bleaching of cotton, and, in conjunction with Mr. D. A. Langsdale, B.Sc., S.I.C., on the action of ozone on chlorinated wool.

Mr. Trotman agreed with Higgins in attributing bleaching action to hypochlorous acid, and showed that the time absorption curves by which the absorption of chlorine by cotton were recorded were nearly identical whether pure hypochlorous acid was used or the product of the action of boric acid on bleaching powder. Bleaching powder itself gave a much slower absorption. Hypochlorous acid prepared as above or by the action of cylinder chlorine on a suspension of calcium carbonate, imparted a much whiter bleach than the usual process, and the goods also had a lower ash and a lower copper value (which was an index of the amount of oxycellulose formed by oxidation). By using hypochlorous acid the expense and time of the souring were avoided. The long continued treatment of chlorinated woollen goods with ozonised air was found to enhance the effects produced by over-chlorination, which, as already shown, were mainly due to the destruction of the epithelial cells of the fibres.

The ozonisation led to a further decrease in felting power and elasticity, and with this was associated an increased solubility in sodium carbonate solution, absorption of atmospheric moisture, and power of fixing dyes. Wool goods already damaged by over-chlorination were more susceptible to further damage of this sort.

Sodium Phosphate Inquiry

Official Referee Decides against Complainants

THE text of the decision of Mr. Cyril Atkinson, K.C., the Referee under Part I. of the Safeguarding of Industries Act, with regard to Sodium Phosphate (the proceedings were reported in THE CHEMICAL AGE for December 2, p. 786) is as follows:—

"In this case the complaint referred to me is that 'Sodium Phosphate' has been wrongly included in the list of dutiable substances. The complainants claim that under this complaint they are entitled to ask me to consider the propriety of the inclusion in the list of mono-basic phosphate of sodium, di-basic phosphate of sodium, tri-basic phosphate of sodium, and pyro-phosphate of sodium, both in the neutral and acid varieties. The words 'Sodium Phosphate' do not occur in the list without some further word of description. It is, therefore, necessary to determine which article or articles in the list is or are referred to by these words.

"It is the duty of a complainant to indicate with at least reasonable certainty which article is the subject of his complaint. There is no difficulty about using the exact description appearing in the list. Departure from such a course must lead to ambiguity. The evidence called by the complainants is established quite clearly, and I find, as a fact, that both in the trade and among chemists 'Sodium Phosphate' is the substance described in the list as 'Sodium Phosphate Di-.' The evidence does not suggest that the words 'Sodium Phosphate' have been used or are used to describe any other substance. Yet I am asked to treat the words as co-extensive with the words 'Phosphates of Sodium.' I do not think that I should be justified in so doing. I cannot see how I can give the words 'Sodium Phosphate' any meaning other than that which they, in fact, have. The result is that the only article which I have jurisdiction to consider is that described in the list as 'Sodium Phosphate, Di-.' The letter 'R' appears against it in the list, and it is conceded that, so qualified, the inclusion is not open to objection.

"The complaint, therefore, fails, and no costs will be allowed.

"I understand that there are other complaints referring specifically to 'Sodium Phosphate, Mono- and Tri-.' Nothing I have said prejudices in any way the further prosecution of these complaints."

Explosives Inventor's Claims

A CLAIM in connection with the manufacture of high explosives on a large scale came before the Royal Commission on Awards to Inventors on November 29. For the claimants, Dr. Mott and Mr. A. E. Holley, it was stated that they were on the staff of the First National High Explosives Factory at Oldbury. Before 1917 T.N.T. was made by an intermittent process, and it occurred to Dr. Mott to try a continuous counter-current process for the nitration and washing of T.N.T., the plant being designed by Mr. Holley. The process, it was stated, was an unqualified success, the plant by various improvements eventually producing several hundred tons of the explosive per week, while the output of the factory from first to last was about 50,000 tons.

The Products Corporation, Ltd.

A NOTICE has been issued to the effect that the chemical business of the Products Corporation, Ltd., of Salisbury House, London Wall, London, E.C.2, has been taken over by Mr. Stanley Hopkins, and will be conducted under the title of "Hopkins, Ellis and Co., Ltd." The Products Corporation in a circular dated November 30 state:—

"We have to inform you that we have decided to discontinue the section of our business dealing with heavy and fine chemicals as from November 30, 1922. We have arranged to transfer our interests in chemicals to Mr. Stanley Hopkins, until recently chairman of this company, and we have every confidence that your requirements will receive the most satisfactory attention at his hands. Mr. Hopkins has taken over the staff of the chemical department, and will be trading under the title of 'Hopkins, Ellis and Co., Ltd.' We understand that Mr. Hopkins will be communicating with you in the course of a few days."

The Royal Institution Programme

THE Juvenile Lectures at the Royal Institution this Christmas will be delivered by Professor H. H. Turner, whose subject is "Six Steps Up the Ladder to the Stars." The following are the lecture arrangements before Easter:—On Tuesday afternoons commencing January 16, there will be two lectures by Professor F. G. Donnan, on "Semi-Permeable Membranes and Colloid Chemistry," two by Mr. R. D. Oldham, on "Earthquakes," two by Professor A. C. Pearson on "Greek Civilisation and To-day," two by Sir Arthur Shipley on "Life and Its Rhythms," and two by Professor C. G. Seligman on "Rain Makers and Divine Kings of the Nile Valley." On Thursday afternoons, Mr. J. W. Fortescue will give two historical lectures beginning on January 18, Professor I. M. Heilbron two on "The Photosynthesis of Plant Products," Professor B. Melville Jones two on "Recent Experiments in Aerial Surveying," and Mr. Theodore Stevens two on "Water Power of the Empire." On Saturday afternoons commencing January 20, there will be two lectures by Sir Walford Davies on "Speech Rhythm in Vocal Music," two by Mr. J. C. Squire on "Subject in Poetry," and six by Sir Ernest Rutherford on "Atomic Projectiles and their Properties." The first Friday evening discourse will be delivered by Sir James Dewar on January 19 on "Soap Films as Detectors of Stream Lines, Vortex Motion and Sound." Succeeding discourses will probably be given by Sir Almroth Wright, Mr. C. F. Cross, Sir John Russell, Dr. A. V. Hill, Professor A. S. Eddington, Dr. G. C. Simpson, Dr. M. R. James, and Sir Ernest Rutherford.

Chemistry in Everyday Life

THE importance of scientific investigation and the necessity of public weight behind it were the points emphasised by Professor F. J. Wilson, of the Royal Technical College, Glasgow, in an address to the City Business Club, recently. Professor Wilson said that although it was not generally recognised, chemistry entered into all the industries upon which not only the comfort but even the life of the people depended—the great manufacturing industries and agriculture. Chemistry stood for efficiency in all activities of life as opposed to pure empiricism or rule of thumb. It must not be regarded from a purely utilitarian point of view as a means of increasing wealth and material prosperity, because such a view was far too narrow. It had a cultural value, and all its application depended on purely scientific principles. It was often asked, "What is the use of such and such an investigation? It is of no practical value to the world." But if the investigation did add to our knowledge, then sooner or later it would have practical application, and science abounded in such instances. Referring to the dye-making industry, the lecturer said that this was one which depended particularly on pure scientific research.

Chemical and Drug Exporters' Losses

A FURTHER meeting of the creditors of Baiss Brothers and Co., Ltd., Grange Road, London, was held on December 4 at Thames House, Queen Street Place, London. Mr. Ernest Norton, the liquidator in the voluntary liquidation of the company, who occupied the chair, said that at the recent statutory meeting (see THE CHEMICAL AGE, Vol. VII., p. 531) he intimated that negotiations were proceeding for the sale of the business. The creditors authorised him to continue trading and carry on the negotiations. He was now able to report that he had received a definite offer for certain of the assets and an agreement for their sale had been entered into subject to the approval of the creditors.

The liquidator said he was strongly of the opinion that it was to the best interests of the creditors to accept the offer.

On the motion of the principal creditors a resolution was unanimously passed in favour of the offer being accepted.

The liquidator said the distribution of a dividend would largely depend upon the surplus he got from the securities in the hands of the fully secured creditors. Those securities consisted of debts in South Africa, which were only subject to collection. The company had given about six months' credit. He was hoping the creditors would get about 10s. in the £.

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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

Deed of Arrangement

CRANSTON, Edward, 314, Sangley Road, and 100, Culverley Road, Catford, chemist. (D.A., 9/12/22.) Filed December 1. Trustee, H. Carey-Grattan, 22, Suffolk Street, Pall Mall East, S.W., accountant. Liabilities unsecured, £451; assets, less secured claims, £250.

Receiverships

TAUNTON CRAFTSMEN, LTD. (R., 9/12/22.) J. E. Goodland, of 7, Hammet Street, Taunton, was appointed receiver on November 22, 1922, under powers contained in first mortgage debenture dated October 12, 1921.

CUMBERLAND COAL POWER AND CHEMICALS, LTD. (R., 9/12/22.) A. C. Vincent, of 13, Queen Street, E.C., was appointed receiver on November 20, 1922, under powers contained in trust deed dated November 22, 1921.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

BIBBYS (BURNLEY), LTD., druggists. (M., 9/12/22.) Registered November 21, £200 debentures; general charge. *Nil. May 3, 1922.

KLEENIT SOAP AND CHEMICAL CO., LTD. (late SULPHUS CHEMICAL CO., LTD.), Hull. (M., 9/12/22.) Registered November 24, £1,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £500; general charge. *— December 31, 1921.

London Gazette

Companies Winding-Up

OIL PROCESSES, LTD. (CANADA). (C.W.U., 9/12/22.) First and final dividend of 1s. 8d. in the £, payable, December 4, Office of the Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, London, W.C.2.

VICTORS, LTD. (C.W.U., 9/12/22.) Meeting of creditors, December 12, 3 p.m.; and contributories, December 12, 3.15 p.m., Official Receiver's Offices, Byrom Street, Manchester.

Bankruptcy Information

WILSON, Stewart, Burnham Market, Norfolk, chemist and druggist. First meeting, December 9, 12.30 p.m., Official Receiver's Office, 8, Upper King Street, Norwich. Public examination, December 12, 2.30 p.m., Shirehall, Norwich.

TEMPEST, Walter, 45, High Street, Newton-le-Willows, in the county of Lancaster, dye mixer. First meeting, December 13, 11.30 a.m., Offices of the Official Receiver, 11, Dale Street, Liverpool. Public examination, January 5, 1923, 11 a.m., Court House, Palmyra Square, Warrington.

Notices of Dividends

PRESCOTT, Alfred (trading as PRESCOTT AND CO.), Rutland Mills, Oswald Street, Hulme, Manchester, Holt Town, Manchester, and Mill Bank Chemical Works, Triangle, Halifax, Yorks, chemical and aniline dye manufacturer. Amount per £. 2s. 6d. First. Payable, December 4, Webb and Hall, Chartered Accountants, 90, Deansgate, Manchester.

STOPFORTH, Richard (trading as ROWAND AND CO.), 10, Eaton Street, Liverpool, lately 71, Vauxhall Road, Liverpool, wholesale druggist. Amount per £. 3s. 2½d. First and final. Payable, December 14, 35, Exchange Chambers, 2, Bixteth Street, Liverpool.

Company Winding-Up Voluntarily

WARD'S WASTE PRODUCTS, LTD. (C.W.U.V., 9/12/22.) B. Ward, 29, Chapel Lane, Heckmondwike, appointed liquidator.

New Companies Registered

AROMATA CO., LTD. Manufacturers, refiners and dealers in substances and apparatus connected with chemical products generally. Nominal capital, £100 in £1 shares. A director: B. T. Gurney, 12, Wellington Square, Cheltenham.

W. DANIELS (SOUTHERN), LTD., 97, St. Thomas Street, Portsmouth. Consulting, analytical, manufacturing, pharmaceutical and general chemists, drug merchants, etc. Nominal capital, £3,000 in £1 shares.

ECLIPSE CUTTING COMPOUND CO. (1922) LTD. Salop Street, Ripponden Road, Oldham. Drysalts, chemists, etc. Nominal capital, £1,000 in £1 shares.

ECONOMIC DISTRIBUTORS, LTD., Queen's Insurance Buildings, 10, Dale Street. Manufacturers of and dealers in all kinds of manures and fertilisers, soaps, oils, etc. Nominal capital, £500 in £1 shares.

J. H. JENNINGS STORES, LTD., 32, Borland Road, S.E.15. Oil and colour merchants, dealers in drugs, chemicals, etc. Nominal capital, £1,000 in £1 shares.

LIME SUPPLIES, LTD., 10A, Dale Street, Liverpool. Manufacturers of and dealers in lime, manures, fertilisers, agricultural and horticultural chemicals and specialities, soaps, etc. Nominal capital, £500 in £1 shares.

WILLIAM H. PEREGRINE AND CO., LTD. Walmersley Ironworks, Walmersley, near Bury. Manufacturers of machinery for bleaching and dyeing, etc. Nominal capital, £2,000 in £1 shares.

PLANTERS PRODUCTS, LTD. Manufacturers of and dealers in soap, tallow, starch, chemicals, paints, dyes, colours, varnishes and polishes, etc. Nominal capital, £1,000 in £1 shares. A director: J. W. Heywood, 24, Desenfans Road, Dulwich.

SCOTT AND SCOTT, LTD. Importers of and dealers in chemical preparations, compounds, oils, drugs, dye-ware, etc. Nominal capital, £1,000 in £1 shares. Solicitor: Richard Wilks, 25, Abchurch Lane, E.C.4.

SHINELITE, LTD., 2, Southampton Street, London, W.C.2. Manufacturers of and dealers in polishes and paint removers, wax and essential oils, etc. Nominal capital, £5,000 in £1 shares.

SHOTTS APOTHECARIES, LTD. Wholesale, retail and manufacturing chemists and druggists, etc. Nominal capital, £500 in £1 shares. A director: J. Laidlaw, 56, Station Road, Shotts.

SPEAKE, HOLLAND AND CO., LTD. Peckfield Oil Works, Dick Lane, Laisterdyke, Bradford. Manufacturers of and dealers in oils, stearine, asbestos, etc. Nominal capital, £2,000 in £1 shares.

THORNTON AND ROSS, LTD. Manufacturing chemists, druggists, etc. Nominal capital, £1,000 in £1 shares. Secretary: N. Thornton, 11, Lindley Street, Longwood, Huddersfield.

UNITED AMMONIA DISTILLERS, LTD., 4, Regent Street, S.W.1. Ammonia and chemical manufacturers, chemists, druggists, drysalts, etc. Nominal capital, £100 in £1 shares.

